ATLAS OF THE HISTORY OF MEDICINE

I

ANATOMY

J. G. DE LINT

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ΙΑΤΡΙΚΗ ΠΕΡΙ ΤΗΝ ΨΥΧΗΝ
ALFRED. M. HELLMAN

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HISTORY OF MEDICINE

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I

ANATOMY

BY

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WITH FOREWORD BY

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A SERIES OF FIGURES ILLUSTATING THE HISTORY OF ANATOMY

INTRODUCTION.

MANY men of science work habitually with the feeling that they are engaged in investigating something that is more fundamentally true and existent than all that has gone before them. They are seeking — and many of them believe that at times they are finding, — the real causes of things. Their predecessors seem to them to have been steeped in error and frequently in something no better than superstition and folly. The present age, they believe, will at last bring us the truth and all that has gone before may pass away.

Alas for the vanity of human aims! It is not the first time in history that men have dreamed this dream. The more philosophical know well that this search for reality is vain. It may be that such a will of the wisp is needed to lure men, or at least some men, into the boundless morass of phenomena, and that without this *fata morgana* none would enter therein. It may be so, and if it be there may well be uses even for philosophical fallacies! There are, however, men of science whose minds are of a more reflective construction. Perhaps it is with the disillusionment of advancing years that this reflection most often comes. Certain it is that since man first exhibited the scientific spirit he has sought to grasp reality, and as certain that it has as constantly eluded him. What more definite, more positive, more sharply defined than the structure of the human body? Yet this book tells of the ages that it has taken men to reach our current idea of how we are made. Who will be so bold as to say that the image that we now have has come to stay?

Against the more dogmatic and positive spirit of modern science, and especially of modern biological science, history is an admirable antidote. But it is something more. It has a real lesson of its own to teach, which men of science often learn too late. Science, knowledge, does not really present all the facts to the enquiring mind. It cannot do that, for the facts are infinite in number. Science, like Art, must of its nature select its facts, choosing these, rejecting those. Why does it do so? Why are some taken and others left? The answer can only be obtained from History. The truth is that the present state of our doctrine as regards the Material Universe is as much moulded and shaped by tradition as are the laws of our States or the style of our Art. Given another History, another Science would emerge, differently orientated, differently classified, with different emphases and with different nomenclature. To understand a science it is therefore necessary to understand its history. This is perhaps more evidently true of Anatomy than of most disciplines, for the first phrases a student learns tell him something of his forbears.

Despite the historical element essential for the proper understanding of the contemporary scientific position, it unfortunately happens that the man of science is frequently debarred by his temperament, by his training, or even (in a hushed moment be it spoken) by his want of capacity, from studying or understanding history. Apart from the scientist's natural impatience of the stages which have led up to his own stand-point, there are, it must be admitted, great difficulties in his way. Adequate works on the history

of science are by no means numerous. Even when such works are readable, — and are read, — they are often open to the criticism that their discourse is of the older men of science, and neither of the conclusions that they reached nor of their manner of reaching them. Moreover it happens that the older scientific works are not open to all nor indeed to many of us. They demand a knowledge which few possess, a knowledge of dead languages, often of languages so dead as to be in the last stages of decomposition. The few who know these must be, nowadays at any rate, classed as specialists.

These difficulties, are, in part at least, surmounted by Professor DE LINT's method. It is probable that most men of scientific attainments, especially in the department of Biology, take their mental impressions predominantly through the eye. Most of us have found that the preserved specimen, the dissection, the model, the picture, have been aids in our training, and have left a deeper impress on our memory than the written word. It is, in fact, the object itself, and not discourse about the object, with which we are chiefly concerned. It was thus a happy idea of Professor DE LINT to present the History of Medicine in the form of a series of pictures. The perusal of a few hundred pictures can give a good idea of the progress of the knowledge which they embody. They make no demands on the linguistic powers of the reader and they appeal to him in that medium and in that manner through which he is most accustomed to receive his current scientific impressions. On these grounds I believe the venture of Professor DE LINT to be a hopeful one, and I look forward to the subsequent volumes, in which he will complete his panoramic view of the historical development of Medicine.

An obvious criticism of Professor DE LINT's work may perhaps at once be met and partly answered. No two men undertaking a work of this sort would choose precisely the same names or the same figures. Such a choice must, in fact, to some extent express the chooser's personality. The work is none the worse, but rather the better on that account. In the present collection Professor DE LINT has, for instance, selected far more from the Dutch observers than would have been the case had he been an Englishman. This has the advantage of stressing the strong link that has always existed between Dutch and English science and especially during the seventeenth and early eighteenth centuries. I do not remember any medical historian in this country who has brought out this important point. The immense intellectual activity of our near neighbours in the Netherlands cannot fail however to impress the historical investigator. There are many signs of a strengthening of that intellectual alliance between England and Holland. It is appropriate, therefore, that Professor DE LINT should close his series with a portrait of the veteran Dutch biologist DE VRIES, on whom the mantle of DARWIN and MENDEL has fallen. The personality of DE VRIES happily illustrates the immense widening of the biological view, which has come about in the last generation, by the breaking down of the unnatural boundaries which have been erected between the sciences. Let us hope that the process will go yet further and that the study of scientific history will become a part of scientific training. Towards that end I believe that the example of this book will do something to help.

London, February, 1926.

CHARLES SINGER,
Department of the History of Medicine,
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PREFACE.

THE Vesalian exhibition held at Leyden in January 1915 suggested to me the collection of a series of descriptive prints and portraits, illustrating the historical development of Anatomy. The rough draft of the work was completed in 1916 but publication was delayed by the Great War.

Of late years much good work has been done on the History of Anatomy by SUDHOFF, SINGER and others, so that MORTIMER FRANK, in his translation of CHOULANT'S classic *Geschichte der Anatomischen Abbildung*, had to insert a long new chapter on „The Manuscript Anatomic Illustrations of the Pre-Vesalian Period". The delay in publication of this Atlas gave me further opportunity of revising my own work, and especially the section on the Anatomy of the Pre-Vesalian period.

As early as 1861, in his *Geschiedenis van het ontleedkundig onderwijs te Leiden*, SURINGAR had emphasized the fact that Anatomy must be regarded as the basic discipline of all medical science. Those who study Medicine cannot evade it. Anatomy is the earliest medical subject with which the student has to deal. It is the vestibule of the temple of medical science. We should therefore expect that it would find a first place in the affections of the medical student. The truth is, alas, far from this. The subject is often learned merely by rote, and then only with the object of passing examinations. It is only those with surgical ambitions who carry their studies further, and for the most part even they have only an immediate practical end in view. We believe this attitude towards a subject, which has a long and fascinating history behind it, is a real loss to the medical man.

During the XVIth and XVIIth centuries very great advances were made in Anatomy. The period is starred with such names as VESALIUS, EUSTACHIO, WILLIS, SPIGELIUS, HARVEY. The discoveries of such investigators evoked not only men's curiosity but also something akin to piety. Men learned to marvel at the beautiful structure of the human body, regarding it as the greatest wonder of God's creation. Anatomy became so popular that dissections came to be performed in public. WERNER ROLVINK was summoned to the court at WEIMAR to dissect a body, in the midst of festivities, before princes and lords.

But now the state of affairs is far different. How are the mighty fallen! Anatomy is looked on as necessary evil, to be endured and overcome before the student can proceed to what he regards as the proper subject of medical study, the examination and treatment of patients. Why this waning of interest? Students find Anatomy too dry, too much a matter of memory. And yet how entirely is this the reverse of the truth! The many terms of LATIN and GREEK origin which Anatomy demands may provide obstacles for those un practised in those languages, but these are no reasons for neglecting the truly romantic side of an important branch of study.

In our own time the subject should, in fact, make a special appeal. Added to the fact that Anatomy is an absolutely necessary preliminary to Medicine, it has of late years appeared in an entirely new garb and has extended its sphere. Instead of a recital of

strange names, it has become in effect the study of development. Fromerly coarse structure was the sole subject of research. Now, through the improvement of the microscope and advance in experimental methods, anatomical research is directed to the investigation of the development and interrelation of the various tissues and organs. Of late, too, the History of Medicine has entered upon a new period, and Anatomy has not gained least by this renewal of interest.

A survey of Anatomy, a picture of its development from the earliest times to the present day, from its origin as a mere applied art to the scientific stage, will, it is hoped, help to arouse the student's interest. A classical picture of an anatomical procedure, the portrait of one of the heroes of Anatomy, or the title page of one of the great anatomical treatises of the past, can awaken the memory of some anatomical discovery which may become fixed thereby. To aid the study of Anatomy in this way is the chief aim of this atlas. But its author would ask for it also some place in the library of the practitioner who may desire to occupy his leisure with the study of the History of Medicine.

It may be said that this atlas does not satisfy these needs completely, and I freely admit this. I am aware of having achieved but imperfectly the aim that I have set myself. Thus, while I have tried to reproduce the original drawings in every case where the anatomist himself claimed to have made an original discovery, there were many instances in which, for a variety of reasons, this was not possible, or was not desirable. In such cases I have had to be content with a portrait of the discoverer or with the title page of a book. Again I was not able to secure portraits of some important figures, such as KASPAR FRIEDRICH WOLFF, the father of the doctrine of the Epigenesis. On the other hand, the kindness of Dr. CHARLES SINGER of London has enabled me to produce six drawings which occur in a manuscript of the thirteenth century. For this kindness, and for his revision of the English edition, I would offer him my grateful thanks.

Professor KARL SUDHOFF of Leipzig has given me permission to reproduce a few plates published by him for the first time in the *Archiv für Geschichte der Medizin*, for which I am extremely grateful to him. My best thanks are also due to Dr. F. M. G. DE FEYFER of Geldermalsem for kindly allowing me to use a few figures illustrating the circulation of the blood.

The author and publishers are fully aware that this atlas is capable of extension and improvement. They will be grateful for any criticisms or suggested additions to it.

J. G. DE LINT.

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ANATOMY.

Fig. 1.

Clay model of sheep's liver used for instruction in Babylonian Temple school about 2000 B.C.
The original object is in the British Museum. It is described by M. JASTROW *Proceedings of the Royal Society of Medicine* (*Historical Section*) VII. p. 109, London 1914.
The model is covered with cuneiform writing. The inscription furnishes prognostications for the peculiarities noted at the various parts of the liver. The right and left lobes, the caudate lobe, the quadrate lobe, the portal fissure, the cystic duct, the hepatic duct, the gall bladder and the fossa of the umbilical vein are all shown. Technical names are given in the inscriptions to these and other parts. The lines indicate conventionally the markings on the surface due to the subsidiary ducts that convey bile to the main duct.

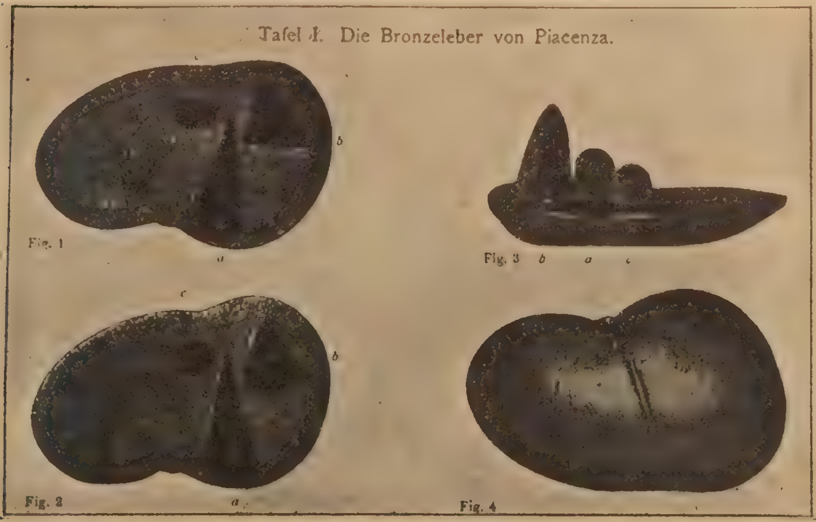


Fig. 2.

Bronze model of sheep's liver with Etruscan inscriptions.
The model is described by C. THULIN, *Die Götter des Martianus Capella und der Bronzeleber von Piacenza*, Giessen 1906.
This model was found at Piacenza and, like the Babylonian form, was doubtless used in divination. The Etruscan language in which the inscription is written cannot be understood by scholars but there is reason to believe that an astrological element is involved. It is impossible to fix the period at which this model was made but we may suggest that it is of about the fifth century B. C.

Fig. 3.

Sketch of sheep's liver bearing the Babylonian names for the various parts. See JASTROW as for Fig. 1.

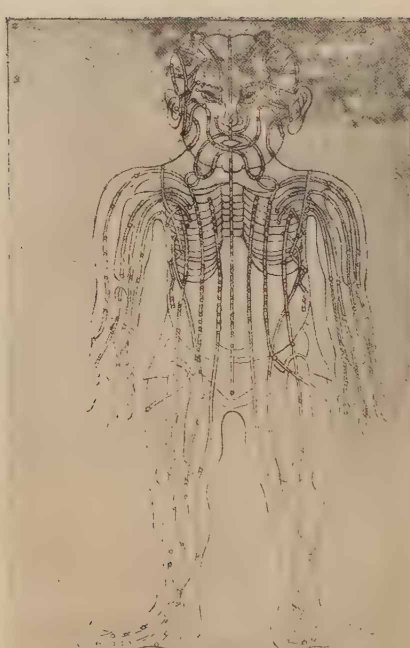


Fig. 5. Chinese anatomical system. From ANDREAS CLEYER. *Specimen medicinae sinicae.* 1682.

According to native tradition the Emperor Hou-Ang-Fi drew up a medical system as early as 3216 B.C. It is at least certain that Chinese anatomical representations are of great antiquity. We here see a tube, the windpipe, passing from the mouth to the heart. From the heart pass three tubes, one to the spleen and kidneys, a second to the alimentary tract, a third to the gall bladder. A tube passes from the brain through the spinal column to the rectum. In certain respects the system recalls that described in certain of the so-called „Hippocratic writings."

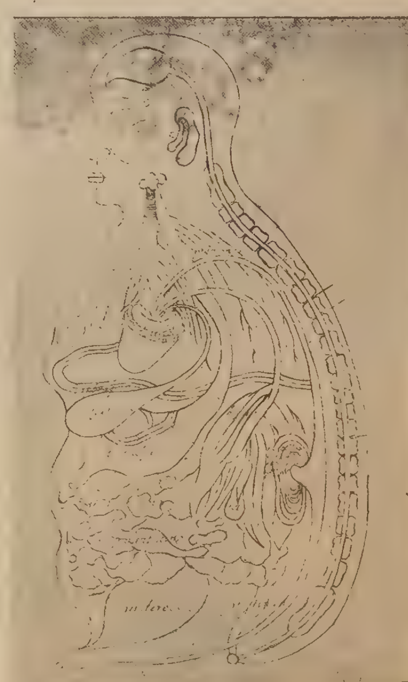


Fig. 4.

Fig. 5.

Fig. 4. Chinese version of the vascular system. From ANDREAS CLEYER *Specimen medicinae sinicae* 1682.
The Chinese attach great importance to the vascular system. The feeling of the pulse plays an extraordinary part in diagnosis among them. On the arms alone thirty different places are described at which the pulses may be felt. An accurate pulse examination by a Chinese physician may last for hours. According to the Chinese the blood vessels are filled with a mixture of air, blood, and milk. This mixture flows through the same paths fifty times in twenty-four hours. The minutiae of pulse lore and pulse examination among the Chinese are reminiscent of ancient Egyptian medicine as well as certain aspects of Greek and Arabian medicine.

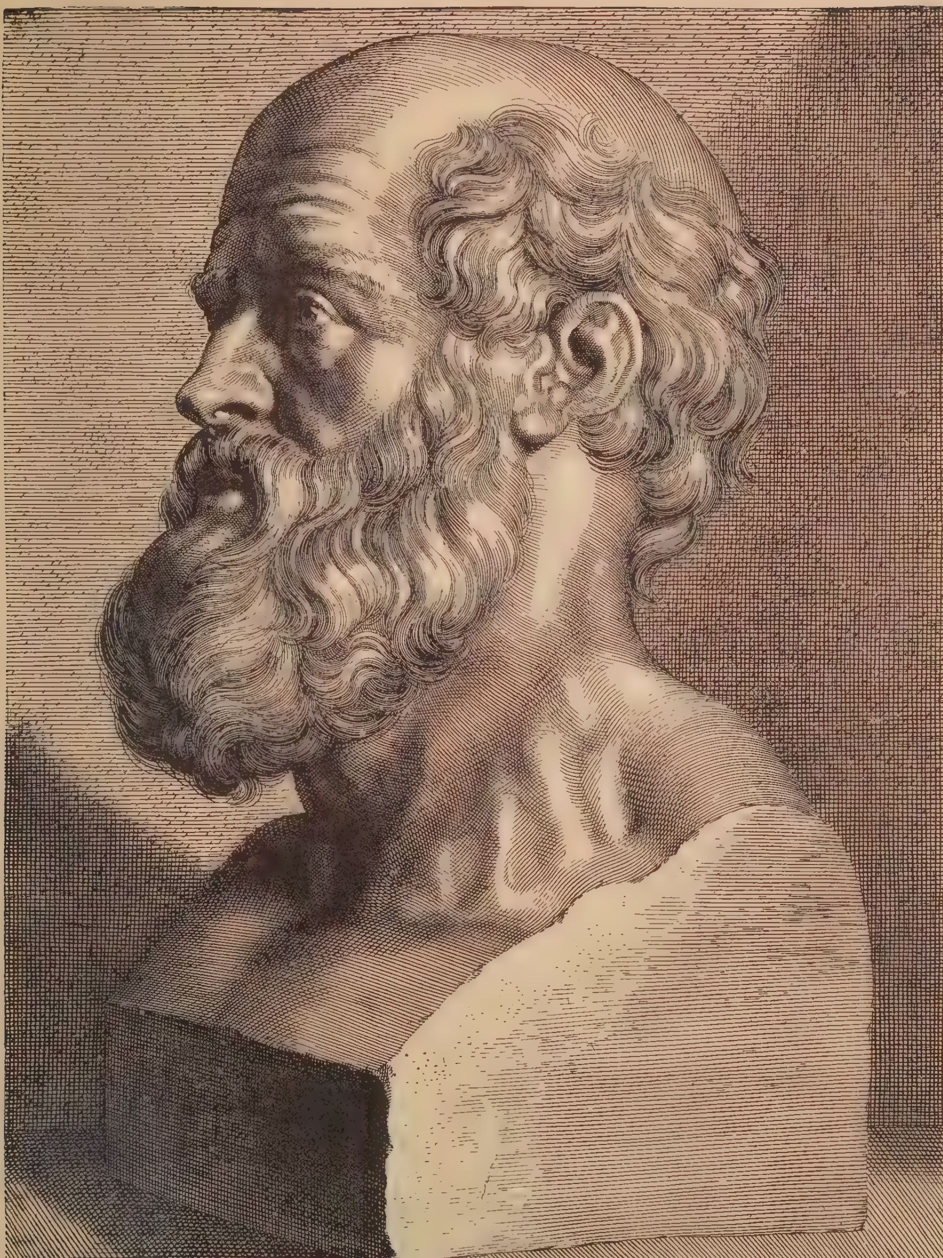


Fig. 6.

Traditional portrait-bust of Hippocratēs of Cos.
The great physician, HIPPOCRATES, Father of Medicine, is a shadowy figure of whose life we know next to nothing. The traditional dates of his life are from 460 B.C. to 370 B.C. A number of ancient Greek works are ascribed to him and were put together in the age that succeeded him. These works are known collectively as the *Hippocratic Collection.* It is made up of about a hundred separate works. They can be shown by convincing evidence to be by many different hands and it is impossible that any but a very few of them can be by HIPPOCRATES himself. It may well be that none of them are by him.
Several of the works of the Hippocratic Collection are anatomically interesting. Among them are the famous works on the *Sacred Disease,* and on *Airs, Waters and Places,* the surgical treatises on the *Wounds of the head,* and *On fractures and dislocations* and the treatise *On the Nature of Man.* Very disappointing are the professedly anatomical treatises in the Collection *On the heart* and *On anatomy.* No consistent anatomical or physiological doctrine can be elicited from the Hippocratic Collection since the points of view of its various authors are very different. It may be said, moreover, that the works of the Hippocratic Collection exhibit very little of any direct knowledge of human anatomy, but that they exhibit some acquaintance with the structure of animals.

Physiological diagram of vascular and respiratory system according to the Hippocratic Collection. From F. M. G. FLYFER. „History of the Circulation of the Blood", *Medical Review*, 1907. Despite the absence of consistent physiological doctrine in the Hippocratic writings, certain authors have thought, that they could present some account of the teaching of some of these works. Such an attempt we here place before the reader.
The heart is held by certain of the Hippocratic writings to consist of two ventricles. These are connected by passages in the *septum ventriculi*. Through these passages in the septum blood passes from the right to the left ventricle. At the same time air, or *pneuma*, passes from the trachea through the lungs to the so-called *arteria venalis* (our pulmonary vein), to the left auricle and finally reaches the left ventricle. The pneuma there mixes with the blood. The pneuma warms the blood which is sent forth from the ventricle through the aorta to the various parts of the body. On the other hand, the blood receives from the liver a nutritious fluid which is carried from the liver into the right ventricle. This nutritious fluid is distributed by the blood to the various organs by the great veins, which are regarded as arising from the right ventricle.

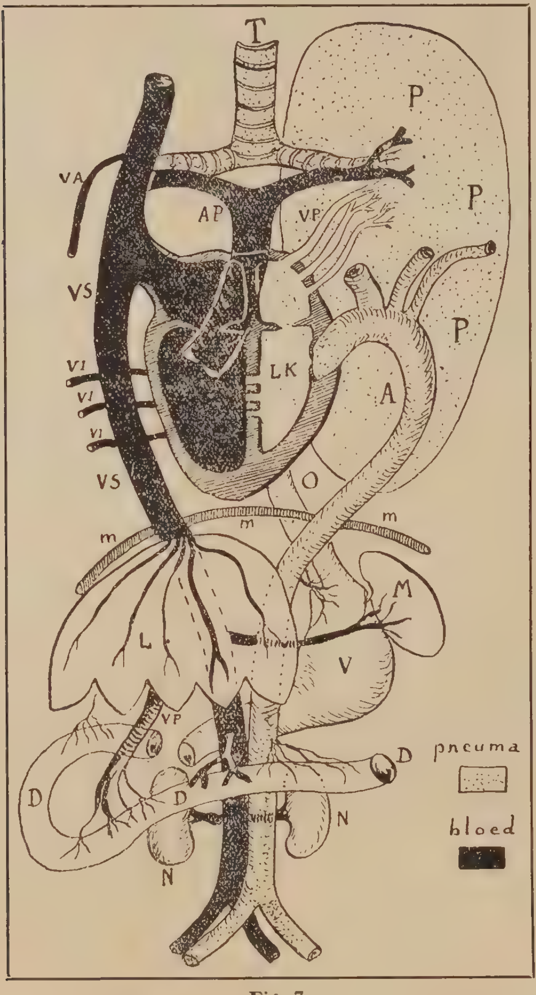


Fig. 7.

Clay model exhibiting trachea, bronchi and lungs, forming a so-called *votive offering* of about the first century B.C. From the collection of E. MEYER-STEINEGG.
In classical antiquity the treatment of disease was often undertaken by the priests. Part of the priestly treatment was the prescription of „temple sleep", the so-called *incubation*. As a part of this process the patient sometimes sought to direct the attention of the god to his particular affection, by hanging a model of the diseased part in the temple. Many such models have survived. The occasionally betray elementary anatomical knowledge.
In the votive offering before us we can see the trachea with its cartilaginous rings, the division of the trachea into bronchi, the passage of the bronchi into the lungs, and the division of the lungs into lobes. The figure suggests some slight acquaintance with human anatomy. Such knowledge was available after the foundation of the great medical school at Alexandria about 200 B.C. At Alexandria there taught from soon after its foundation two eminent anatomists HEROPHILUS and ERASISTRATUS. The former has left his own name in the *torcula Herophili*, while the latter gave its name to the *calamus scriptorius*.

Fig. 8.

ARISTOTLE, 384—322, B.C.
It is not certain that any portrait of ARISTOTLE, the greatest of the pupils of PLATO, has come down to us. Nevertheless, there are many representations of him in the books of Renaissance writers and one of these imaginary XVIth century portraits we here present to the reader.
ARISTOTLE examined the structure of a great number of animals and thus enriched biological knowledge. He divided the parts of the body into two classes. On the one hand there were the *homoiomeria*, that is to say similar or homogeneous parts, such as blood, fat, cartilage, etc., or as we should now call them *tissues*. These were distinguished from the *anhomoiomeria*, that is to say the dissimilar or non-homogeneous parts, such as the hand, liver, brain, etc. or, as we should now call them, *organs*. It is probable that ARISTOTLE never dissected the human body, and his descriptions of human anatomy are confined to external parts. As to the internal organs of man he tells us that they are little known, and knowledge of them must be gathered from the anatomy of those animals that are most comparable to man. ARISTOTLE tells us, however, that the human brain is relatively larger than that of any other animal and that the human heart lies on the left side. He makes the statement that the human kidneys are lobulated. He laid very great emphasis on the heart, which he regarded as the seat of the intelligence, and he tells us that blood flows from it to the extremities.

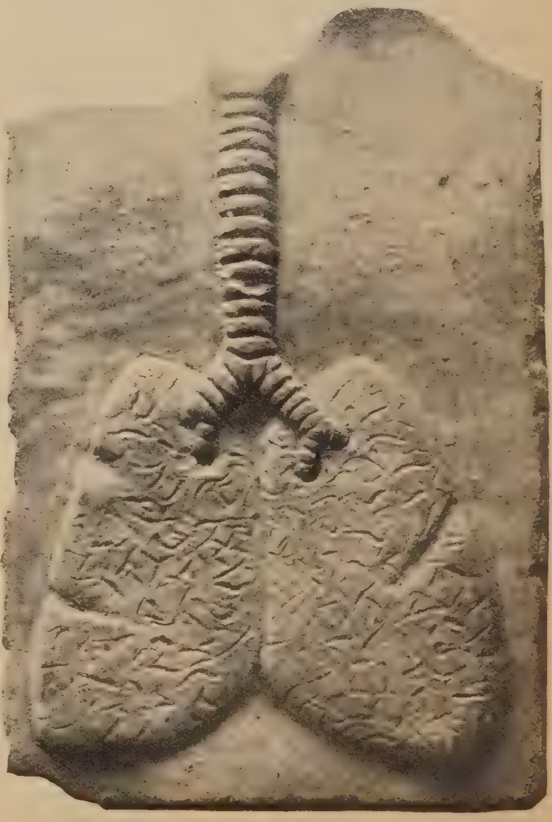


Fig. 9.

Fig. 10.

Fig. 11.

AULUS CORNELIUS CELSUS, c. 25 B.C. to c. 50 A.D. An imaginary portrait of the XVIth century.
Of the Latin writer CELSUS we know next to nothing except that he wrote an encyclopaedia of which the medical section remains. This medical work of CELSUS, *De medicina*, is in many ways the best and most comprehensive treatise of its kind that has come down to us from antiquity. It is divided into eight books of which the last two are devoted to Surgery. The last book opens with a detailed account of the bones, beginning with the skull and treating, in consecutive order, the spinal column, the ribs, sternum, clavicle, arm and hip bones, ending with the bones of the lower extremities. CELSUS also gives an elementary account of the structure of the eye.

RUFUS, of Ephesus, (flourished about 100 A. D.) An imaginary XVIth century portrait.
RUFUS was a compiler. His work is valuable because he has preserved fragments of the Alexandrain anatomist HEROPHILUS. RUFUS was however also an independent observer and dissected apes. RUFUS regarded the nerves as the origin of all functions of the body. He took over from HEROPHILUS the idea that the motor and sensory nerves had a separate origin.

Fig. 12.

GALEN of PERGAMUM (131—201 A. D.) An imaginary portrait of the XVIth century.
GALEN is the one author of antiquity of whose anatomical writings very substantial remains have come down to us. In his various works he gives detailed anatomical descriptions. These are founded for the most part upon his own dissections and experiments. He used monkeys, dogs, pigs and bears. The internal organs of the pig were thought by him to correspond fairly closely with those of man. The anatomy of GALEN continued to be regarded as absolutely authoritative till the time of VESALIUS. From the descriptions of GALEN no one dared to differ. Even in the XVIth century, when VESALIUS pointed out to JACOBUS SYLVIUS of Paris certain errors of GALEN, SYLVIUS, who was an ardent admirer of GALEN exclaimed. „Then man must have changed his structure in the course of time, for the teaching of GALEN cannot err."

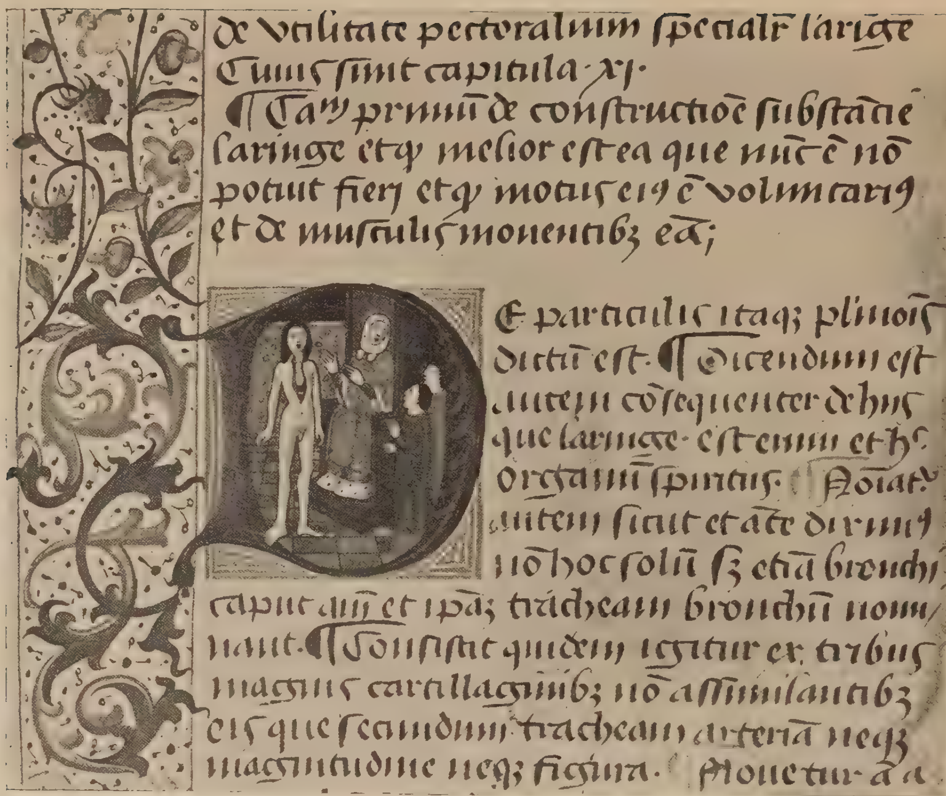


Fig. 13.

Initial letter from a Latin manuscript of GALEN of about the middle of the XVth century, in the Royal Library at Dresden. The miniatures in this manuscript have been reproduced by E. C: VAN LEERSUM and W. MARTIN in their *Miniaturen der lateinischen Galenos-Handschrift der Kgl. Oeffentl. Bibliothek in Dresden*, Leyden 1910.
In various miniatures of this manuscript a teacher in full academic dress in shown giving instruction to pupils. Some of the miniatures, such as that here reproduced, portray anatomical demonstrations. The teacher is demonstrating on a body, the thorax of which has been opened.

Fig. 14.

In the XVth and XVIth centuries there was a revival of interest in the text of GALEN. Greek manuscripts of GALEN had been recovered and scholarly Latin translations of them were frequently printed. Of these the most valued are the so-called „Junta editions". These were issued by the firm of Junta in Venice from 1541 onwards. On the Junta editions were based the editions issued by the well-known printing firm of Froben of Basel.
The Junta editions are illustrated by a series of imaginary scenes, one of which we here reproduce. It represents a disputation over the dissection of a swine. The bodies of another swine and of two sheep are being brought in at the right of the picture. The scene presented is GALEN'S „Disputation with Alexander" (*Disceptatio cum Ale(xandr)o habita*). The anatomist Alexander was one of the teachers of GALEN'S patron Flavius Boethus. Alexander stands on the left side of the picture and GALEN on the right. The scene is described in GALEN'S work known as *De praenotione.* Other anatomists, some of whom are mentioned in that work, are also shown in the picture. To the left are Antigenes, Demetrius and Adrianus, to the right Martianus and Eudemus. Above on a dais sit Barbarus, Boethus, Paulus and Severus. The reader will note the anachronism that many of the audience wear turbans and the dress of modern orientals.

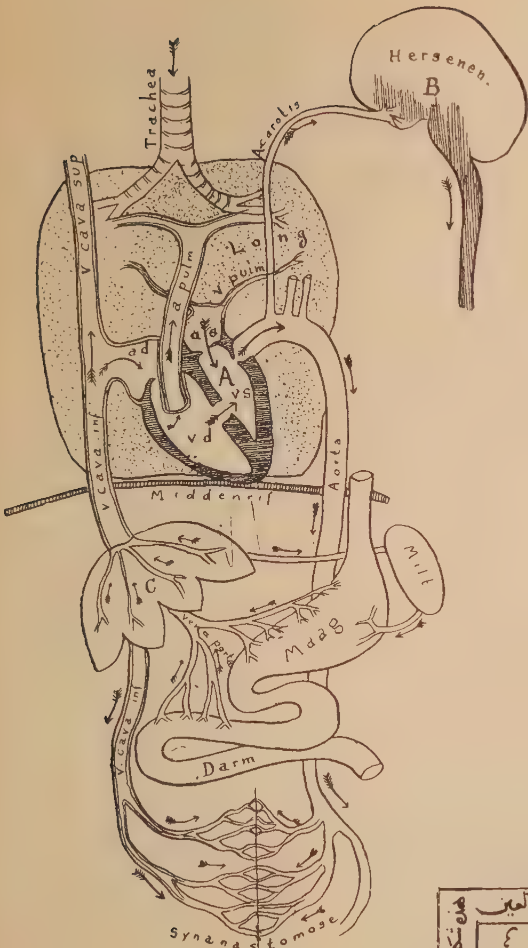


Fig. 15.

Diagram to illustrate the physiological system of Galen. After F. M. G. de Feyfer, *Medical Review*, 1907.

Galen taught that ingested food in the intestines (*Darm* in diagram) was absorbed therefrom and carried by the *vena portae* to the liver (marked C in diagram). It was then elaborated into dark, thick blood. This blood served for the nourishment of the body. It was charged in the liver with the so-called *natural spirits*. Blood bearing these spirits was carried through the *vena cava* and distributed by the venous system to all parts of the body. A little of this venous blood penetrated the septum of the heart from the right ventricle (*vd* of diagram) to the left ventricle (*vs* of diagram). In the left ventricle it came into contact with air which was supposed to be drawn through the trachea, lung and *vena pulmonalis* (i. e. pulmonary artery). In contact with this air or pneuma it became charged with *vital spirits*. The arterial blood thus charged was distributed to the various parts of the body by the arterial system. The arterial blood was thinner and clearer than the venous. Some of the arteries passed to the brain (*Hersenen* in diagram). The blood thus conveyed to the seat of the soul became charged with yet a third kind of spirits, the *animal spirits*. These were distributed to the body by the nerves which were supposed to be hollow.

Fig. 16.

Diagram of the relations of eye, optic nerves and brain. From the Arabic Manuscript numbered 924 in the Library of the„ New Mosque" at Constantinople, written in the year 1560. See K. Sudhoff. *Archiv für Geschichte der Medizin*, VIII p. 15, where the further literature is given.
This interesting diagram though prepared in the XVIth century was copied from a much more ancient document. It exhibits clearly the optic chiasma and the main origin of the nerves of each side from the opposite side of the brain. It also exhibits the structure of the eye itself and certain points in the anatomy of the brain.

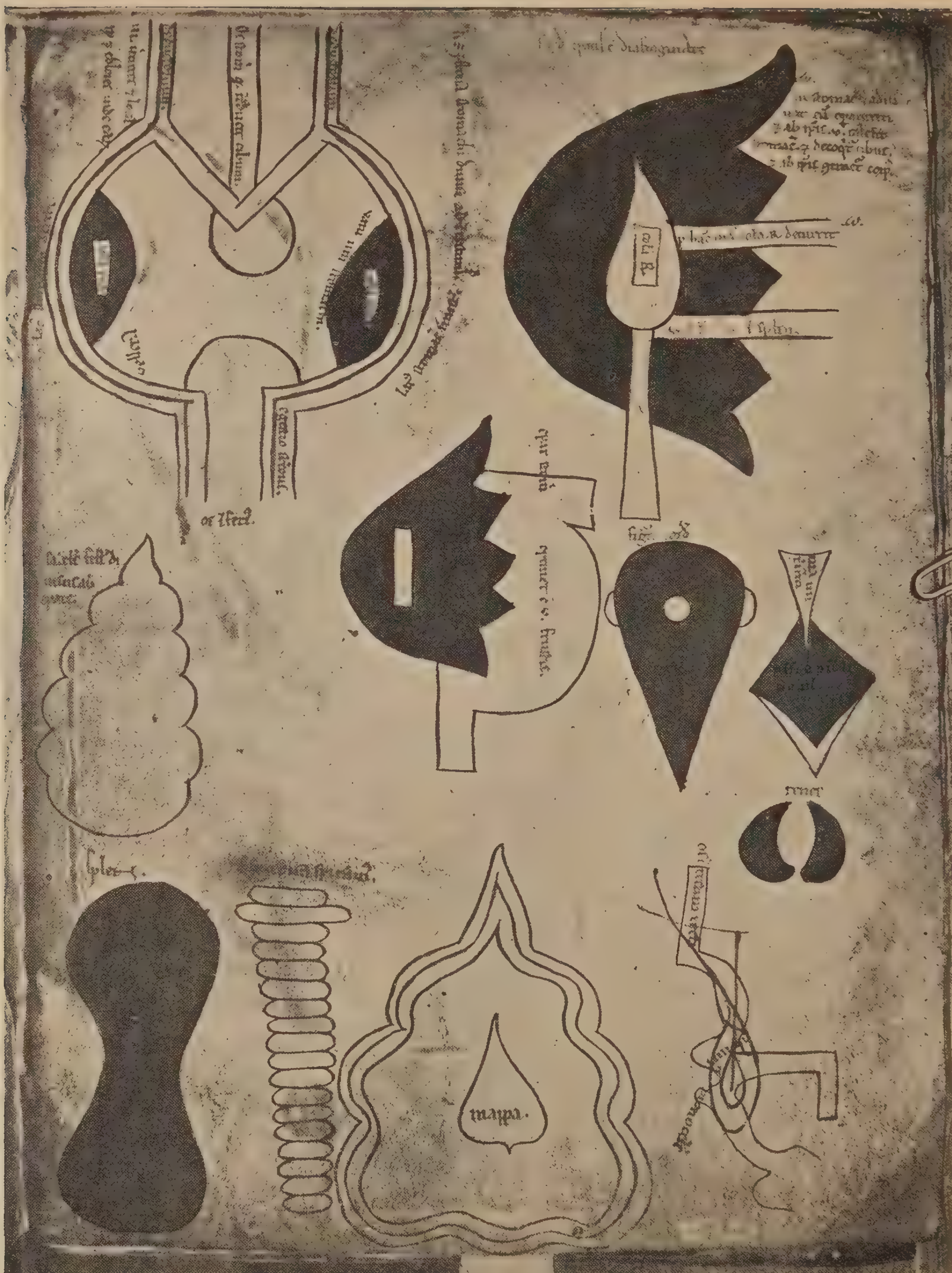


Fig. 17.

Diagrams of the abdominal organs from a MS of the XIIIth century. Caius 223/190. Photograph lent by C. Singer.

In the upper row we have to the left the spherical stomach, and to right the five-lobed liver. In the middle row we have from left to right representations of the gall bladder, the five lobed liver embracing the stomach, the heart, and the root of the lungs. In the lowest row we have from left to right the spleen, the trachea, the omentum, the intestine, and (a little above), the kidneys.

All the representations are extremely bad, and are copied from earlier manuscripts without any appeal to the objects.

Fig. 18.

Diagram of structure of male genital organs according to mediaeval belief.

From a manuscript in the Bodleian Library at Oxford, Ashmole 399, of about the year 1300. The figure is taken from that of CHARLES SINGER in the Proceedings of the *Royal Society of Medicine* Vol. IX. 1916.

The thick black vertical line in the middle of the figure represents the duct of the urethra passing from the bladder below to the penis above and ending at the glans which is clearly shown. The testicle may be seen as a round structure on either side. The *funiculus spermaticus* is shown on either side running round the testicle to terminate in the urethra close to the bladder. At their point of termination a gland is indicated the duct of which is shown entering the urethra. The prostate is probably intended.

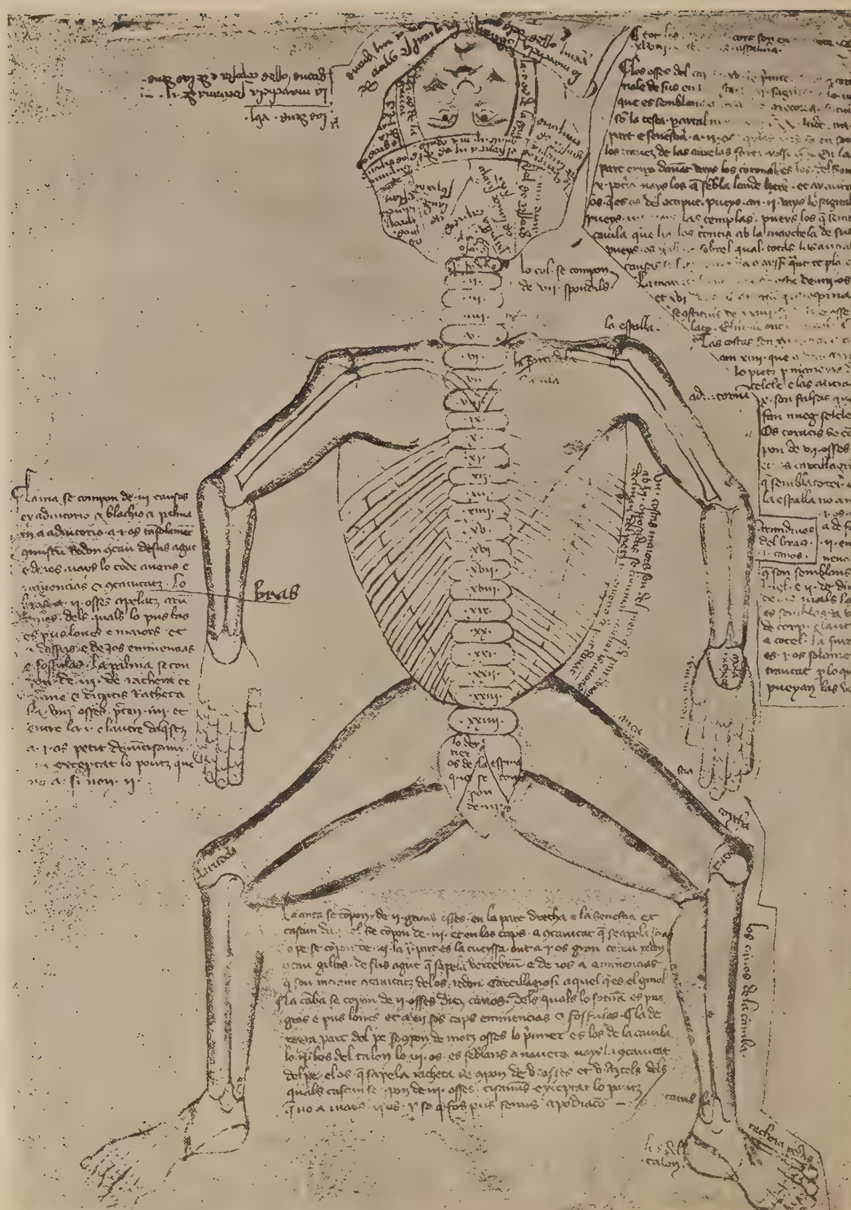


Fig. 19.

The skeleton as represented at the end of the XIIIth century. From the Provencal manuscript in the Basel University Library (D II 11) reproduced by K. SUDHOFF in his *Beitrag zür Geschichte der Anatomie in Mittelalter Leipzig,* 1908.

The skeleton is viewed from behind. The head is so bent backward that the mouth is shown at the top. The text gives the names of the various parts. The number of the vertebrae is accurately indicated, a very unusual feature in manuscripts of the period.

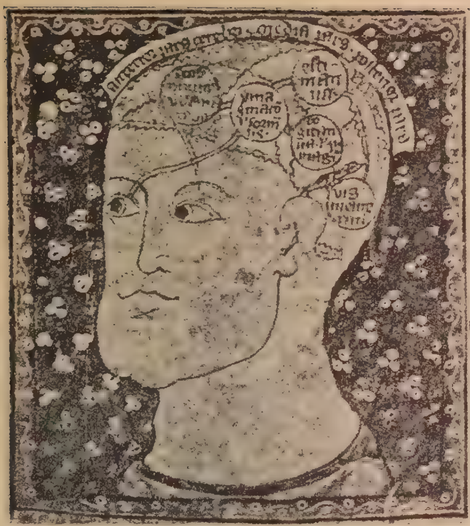


Fig. 20.

The ventricles of the brain from a manuscript of 1310. Cambridge University Library Gg I. 1. See also Walther Sudhoff *Archiv für Geschichte der Medizin, VII.* p. 188.

The inscription above the head tells that the brain is divided into a *pars anterior*, a *pars media* and a *pars posterior*. There are five circles on the brain which indicate the parts of that organ. The two anterior circles indicate the front ventricles, the next two the middle ventricle and the remaining circle the posterior ventricle. Two tubes, representing the optic nerves, pass from the anterior ventricle to the eyes. There are also connections between the various circles themselves.
The supposed functions of the various parts of the brain are indicated. The anterior ventricle governs the *sensus communis vel sensatio* and the *imaginatio vel formalis*, the middle ventricle governs the *estimativa* and the *cogitativa vel imaginativa*, while the posterior ventricle is the seat of the *vis memorativa*. The same ascription of powers may be found in the representation of J. Peyligk as late as 1499 (see fig. 34).

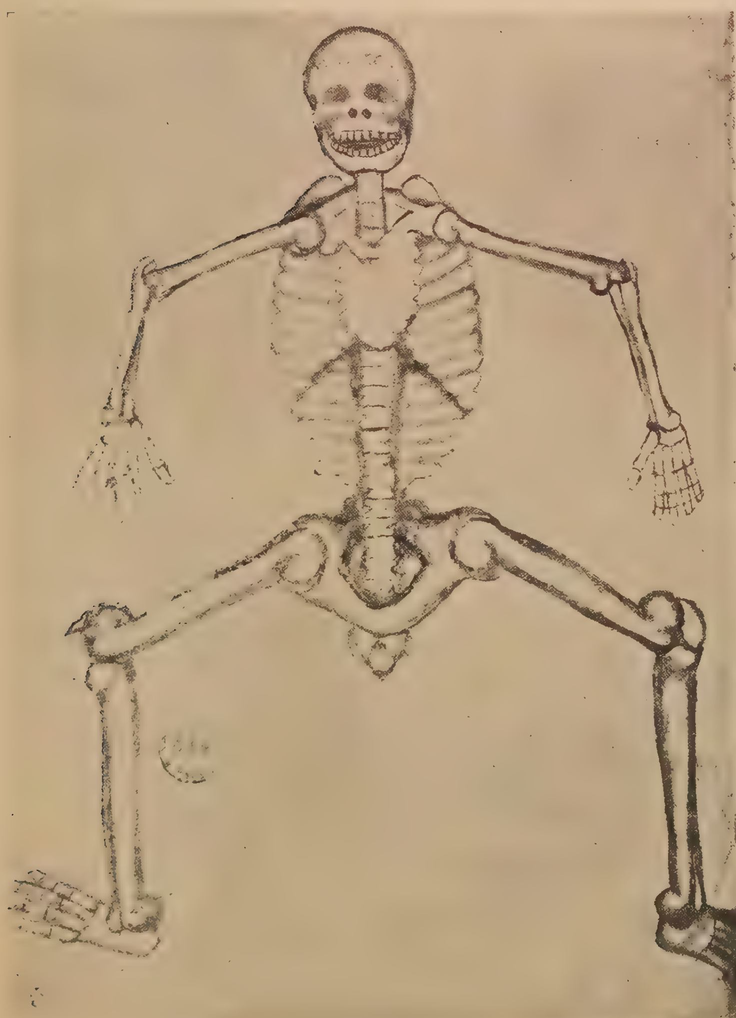


Fig. 21.

The skeleton from a drawing of the year 1323. From a manuscript in the Royal Library at Dresden (C 310) reproduced by K. Sudhoff in his *Beitrag zur Geschichte der Anatomie im Mittelalter*, Leipzig, 1908.

The text of the manuscript from which this drawing is taken is practically identical with that with which Fig. 19 is associated. The skeleton is here shown from the front. The drawing is however much better than that of Fig. 19. We are therefore inclined to believe that the sketch, though extremely rough, does in fact rely upon the object itself. The upper outlet of the thorax is represented as a complete circle of bone, the clavicles terminating in the broad plate-like sternum. The sternum is drawn as one piece with scalloped edges. Behind the circle the tops of the scapulae can be seen peeping up. The pelvis is also shown as a complete circle of bone. The *caput femoris* and the *acetabulum* are conspicuous. We note, too, the forehead divided by a horizontal suture and the large mouth opened to show the teeth. These last features may be compared to those of Helain's skeleton. (See Fig. 32).

Fig. 22.

Venous system from a manuscript of the XIIIth century, Caius, 223/190.
Photograph lent by C. Singer.

The veins are shown radiating from a dark circle which is itself placed over the spherical stomach. Above they converge to the area marked *frons*. The small tributaries of the veins are indicated by feather-like markings. In addition to the veins other organs are represented. From the round stomach there come off the intestines on the left side. These intestines are marked successibely *os stom[achi] inferius, rectum* and *cecum intestini*. The draftsman has placed a coecum also on the right side marking it *monoculus*. The figure shows also the liver bearing the legend, *epar comprehendens stomacum* „the liver clasping the stomach."

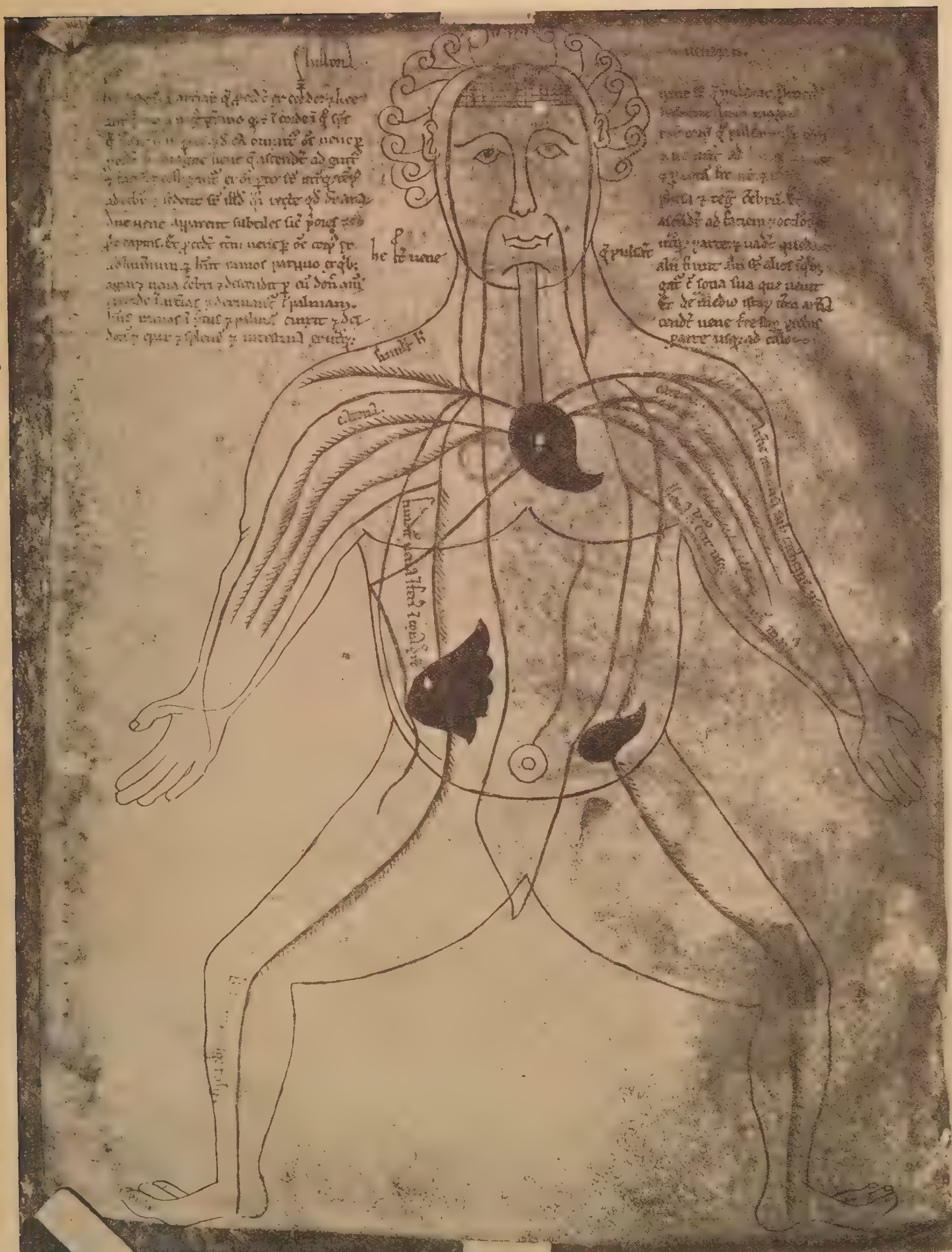


Fig. 23.

Arterial system from a manuscript of the XIIIth century. Caius, 223/190
Photograph lent by C. Singer.

The arteries are seen radiating from the heart and terminating like the veins in feathery ends. The trachea passes direct to the heart in the centre of which is a white spot. Two of the arteries form an anastomosis in the head, intended to represent the *rete mirabile*. The stomach is not represented but the liver and spleen are indicated very low in the pelvis.

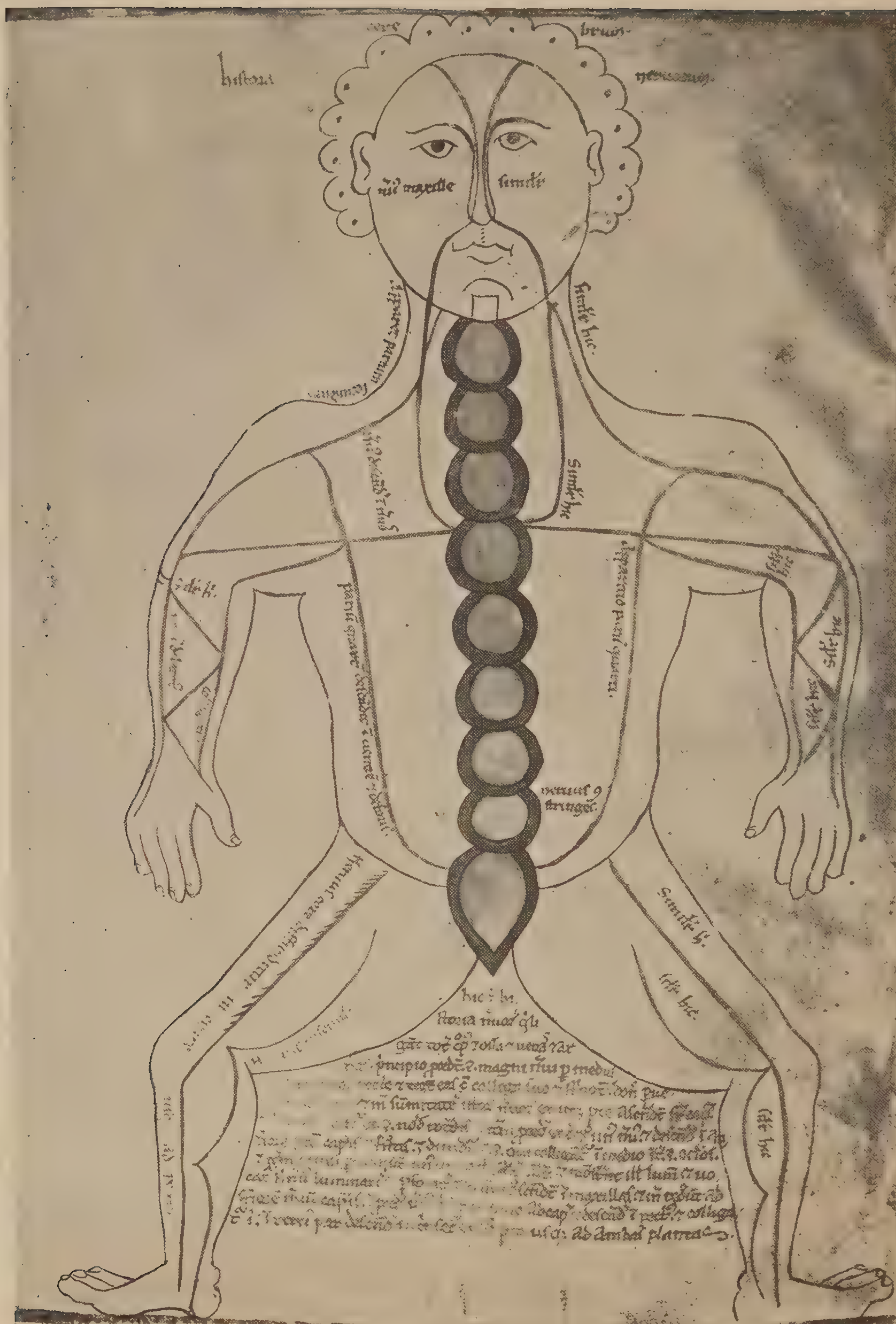


Fig. 24.

Nervous system from a manuscript of the XIIIth century. Caius, 223/190.
Photograph lent by C. Singer.

The head is surrounded by a lobulated structure, marked *cerebrum*, from which the nerves arise. Very peculiar are the two nerves which arise from the brain, pass down the face and into the thorax. The spinal axis is represented as segmented.

Fig. 25.

Muscular system from a manuscript of the XIIIth century, Caius, 223/190.
Photograph lent by C. Singer.

The general muscular masses are distinguished but not the muscles themselves. We see a group of muscles for raising and lowering the arm and similar groups for the thigh and leg. Very peculiar is the circular abdominal muscle and the indications of facial muscles.

Fig. 26.

Osseous system from a manuscript of the XIIIth century, Caius 233/190.
Photograph lent by C. SINGER.

The artist has probably mistaken a posterior view in his original for an anterior. Our figure shows the vertebrae or *ossa catenae* and theirs pines and the *scapulae* but also the face! Together with the previous four figures this form a well-known mediaeval scheme, the *five figure series*, the origin of which, in the opinion of SUDHOFF, is to be sought in Alexandria. They exhibit the extreme defectiveness of mediaeval ideas of anatomy.

Fig. 27.

Dissection scene from a manuscript of English origin of the beginning of XIVth century. Oxford, Bodleian Library, Ashmole 399. The figure has been published by C. SINGER in his *Studies in the History and Method of Science* Oxford 1917, and by K. SUDHOFF in the *Archiv für Geschichte der Medizin* VII. p. 373.

The abdomen has been opened. The operator holds the knife in his left hand and the liver in his right. Other organs are strewn above and below. We may distinguish kidneys; heart and lungs, intestines and stomach.

Fig. 28.

Dissection scene from a manuscript of German origin of the end of the XIVth century, the *Weltchronik* of RUDOLF of EMS. The figure has been published by K. SUDHOFF. *Archiv für Geschichte der Medizin.* VII. p. 337.

From the verse attached we learn that the operator is not engaged in dissection in the ordinary sense of the word, but that he is only satisfying his curiosity as to where he lay in his mother's body! It is the story of NERO.

Fig. 29.

French post mortem scene of the late XIVth century. Montpellier, Library of the Faculty of Medicine, M. S. 1842.

This figure is taken from a French manuscript of the *Grande Chirurgie* of the great mediaeval surgeon GUY DE CHAULIAC. The scene is laid in the bedroom of the deceased. In the top left hand corner is the bed by the side of which a female figure is praying. The corpse, that of a woman, has been opened from the larynx ro the symphysis pubis. The professor is reading from a book, while an assistant, or *Ostensor*, points with a wand to the organs as they are removed. In the foreground is a stool on which lie instruments while a boy holds a vessel to receive the parts as they are disposed of.

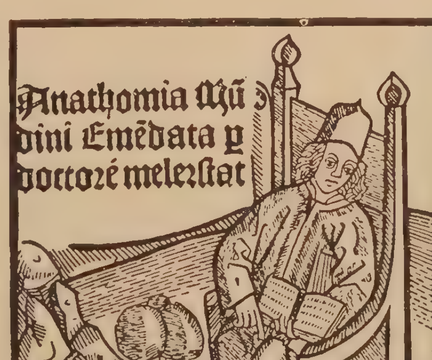


Fig. 30.

Title page of the edition of the *Anathomia* of Mondino de Luzzi, printed at Leipzig in or about 1493 under the editorship of Martin of Mellerstadt, also called Pollich.

This is the earliest edition printed in Germany of this important and influential work which has been translated into English by SINGER. The art of the wood-cutter is still in a very primitive state. The teacher sits in a high chair and wears academic dress. He is apparently in the open air in the midst of a landscape, wherein can be seen hills trees and herbs. He holds a book in his left hand while with his right he points to the dissecting table. On the table lies a corps with abdomen opened. From it the dissector is extracting the intestines. A knife lies on the table in front of the body.

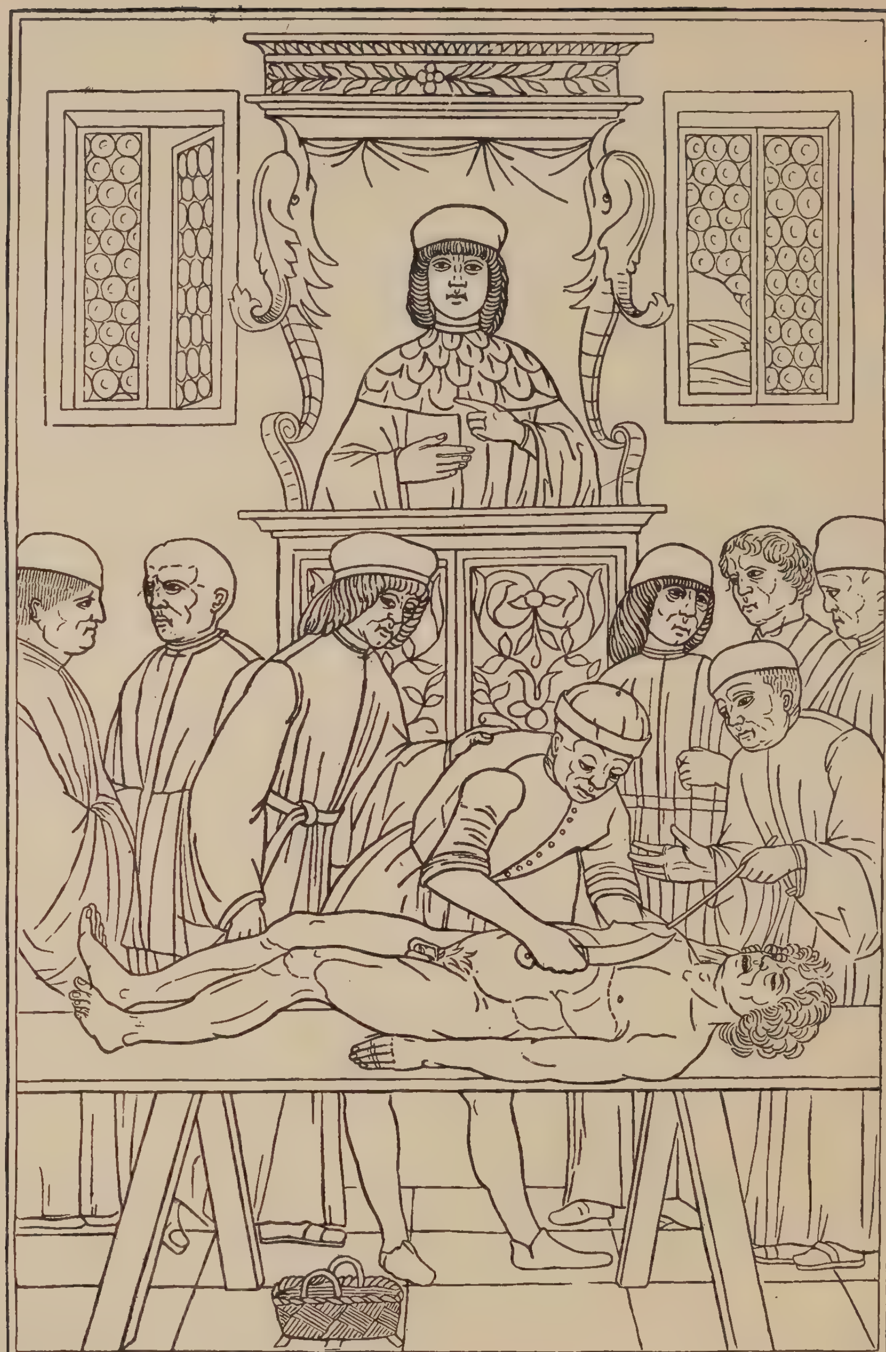


Fig. 31.

Dissection scene from the Italian *Fasiculo di Medicina*, Venice 1493. The work from which this is taken is a collection of beautifully printed and illustrated medical tracts. The collection closely resembles but is not identical with that which appeared at Venice in 1491 and was falsely ascribed to JOHANNES DE KETHAM. Manuscripts of the collection are also known from a much earlier date. The 1493 edition has been reproduced in facsimile by C. SINGER together with a complete translation of the *Anathomia* of Mondino.

The figure before us represents ae anatomical demonstration as it was made at Padua at the end of the XVth century. The professor in full robes sits in his pulpit-like „chair", reading from a book on the desk in front of him. One assistant is about to open the body while a second directs the line of incision with a wand. The body is on a trestle table in front of which stands a basket ready to receive the removed organs.

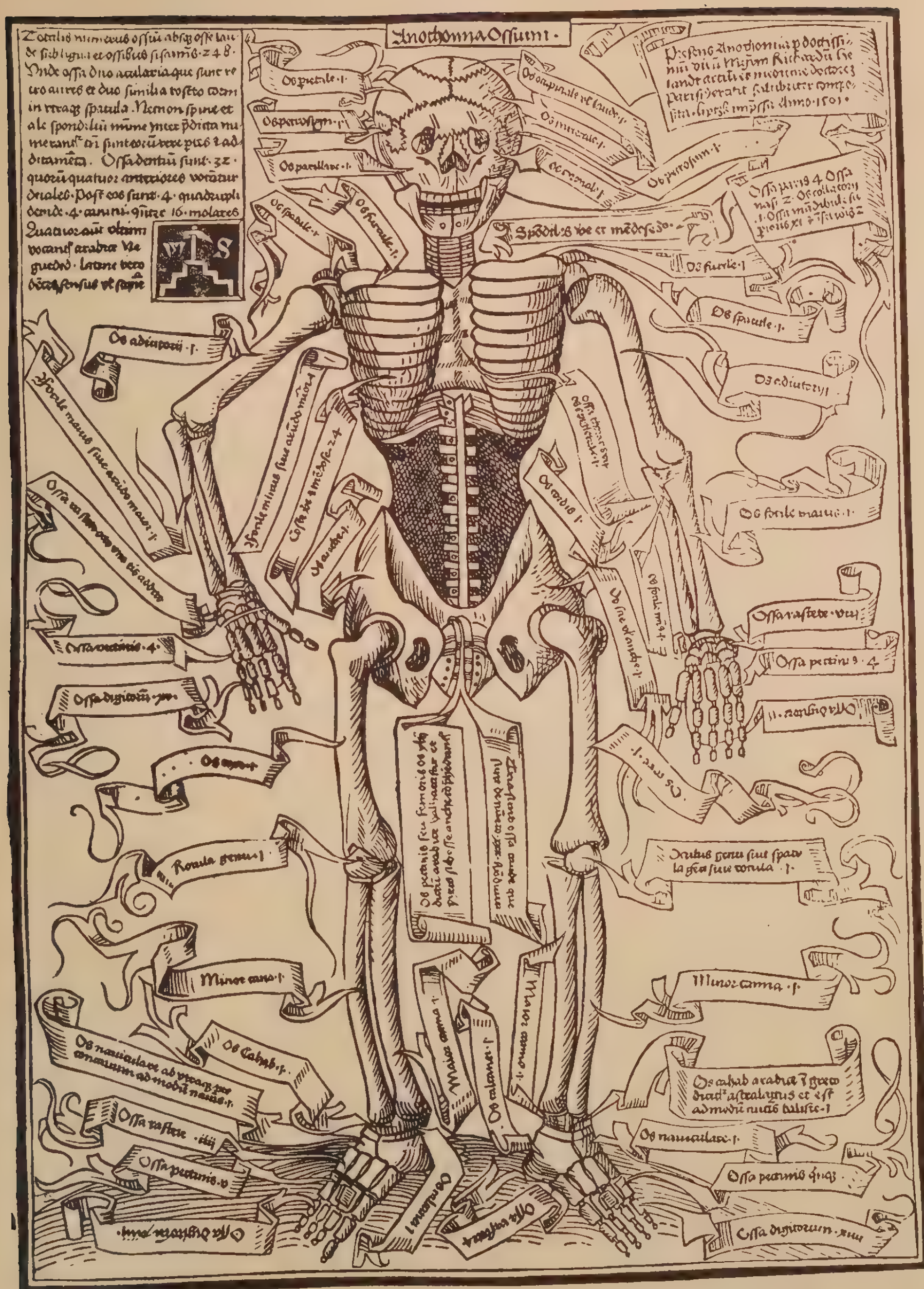


Fig. 32.

The earliest known print of human skeleton. Nurenberg 1493.

This figure is associated with the name of RICHARD HELAIN. It exhibits many extraordinary inaccuracies. Attention may be drawn to the pelvis open in front, to the form of the left humerus, to the square *os calcis*, to the division of the lower jaw into two, to the curiously diagrammatic treatment of the lumbar vertebrae outlined against a black background, and to the sutures of the skull and especially the sagittal suture shortened so as to show the *os occipitale aut laude*. The phalanges of both hands and feet joined to wires and the structures associated with the vertebrae show that a real human skeleton had served as a model.

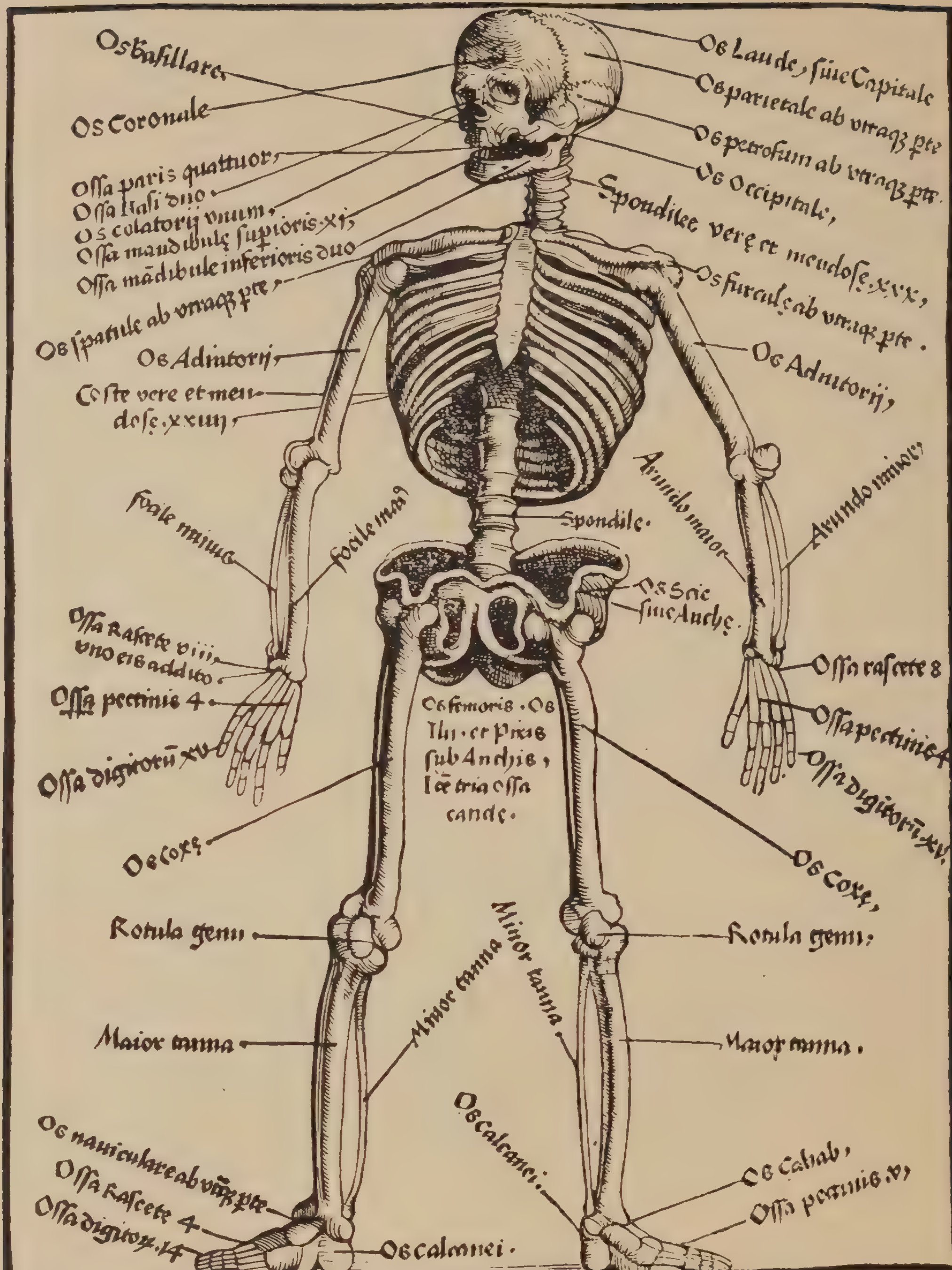


Fig. 33.

Skeleton first published by JOHANN SCHOTT of Strassburg as a separate sheet in 1517 and one year later in the *Spiegel der Artzney* of LAURENTIUS PHRYSIUS.

The pelvis is of a peculiar bowl-shape. It is closed anteriorly. The vertebrae and the cranial bones are more naturalistically drawn than in HELAIN's figure (see Fig. 32). The sternum also is a great improvement. On the other hand we note that the carpus or *os rascete* of the hand is indicated but not drawn.

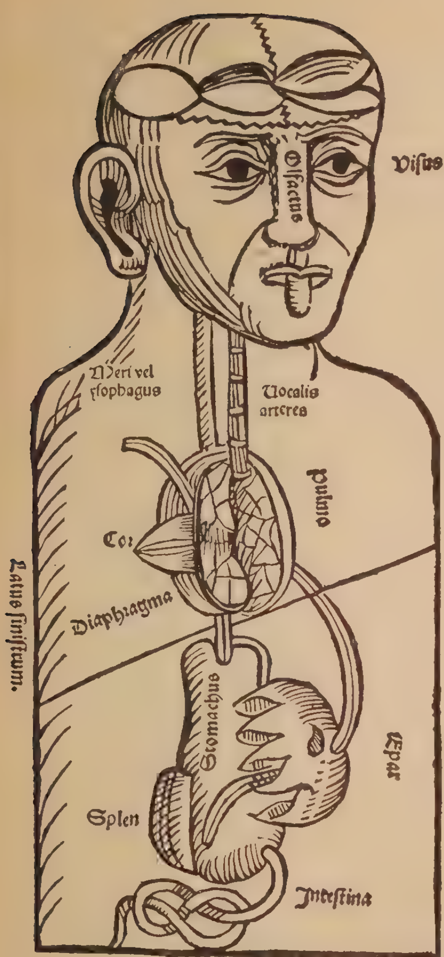


Fig. 34.

Diagram of thoracic and abdominal organs, from JOHANN PEYLIGK, *Philosophia naturalis compendium*, 1499.

The ventricles of the brain are schematically shown. The windpipe is drawn with a few cartilaginous rings. It leads down to the lung. From the (reader's) left side of the lung projects the conical heart. The *Meri vel ysophagus* or gullet descends vertically to the violin-shaped *stomachus*; from the lower end of which passes the intestine tied in a true lover's knot! From the heart, indicated by the word *cor*, issue two great vessels one of which goes to the liver with its five finger shaped lobes. It is marked *Epar*. On the other side of the stomach the *spleen* can be seen. The *Diaphragma* is indicated by a thin slanting line.

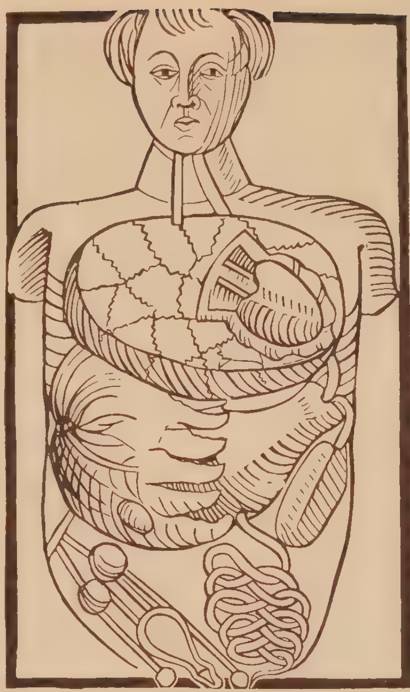


Fig. 35.

Thoracic and abdominal organs from MAGNUS HUNDT, *Antropologium, De hominis dignitate natura et proprietatibus.* Leipzig, 1501.

Passing vertically down the neck may be seen the trachea going to the lungs. On the lungs lies the heart from which two vessels may be seen to arise. Passing obliquely down the (reader's) right of the neck can be seen the oesophagus which below can be traced into the bottle-shaped stomach. Into the cardiac end of the stomach passes a duct from the spleen. From the lower end of the stomach pass the intestines woven into a pattern. To the left is seen the great liver with its finger-like lobes embracing the stomach. The gall bladder lies on the surface of the liver. Below and to the left are two spherical kidneys and a fantastically misdrawn bladder or uterus.

Fig. 36.

NICOLAAS MASSA of Venice who, after having practiced long in that town, died there in 1569. He published his *Introductorius anatomiae* at Venice in 1536. That work contains what is said to be the first account of the prostate, of the olfactory nerve, of the geniohyoglossus muscle and of other anatomical structures. He described the choroid plexus more accurately than any previous anatomist and believed it to be the seat of the soul.

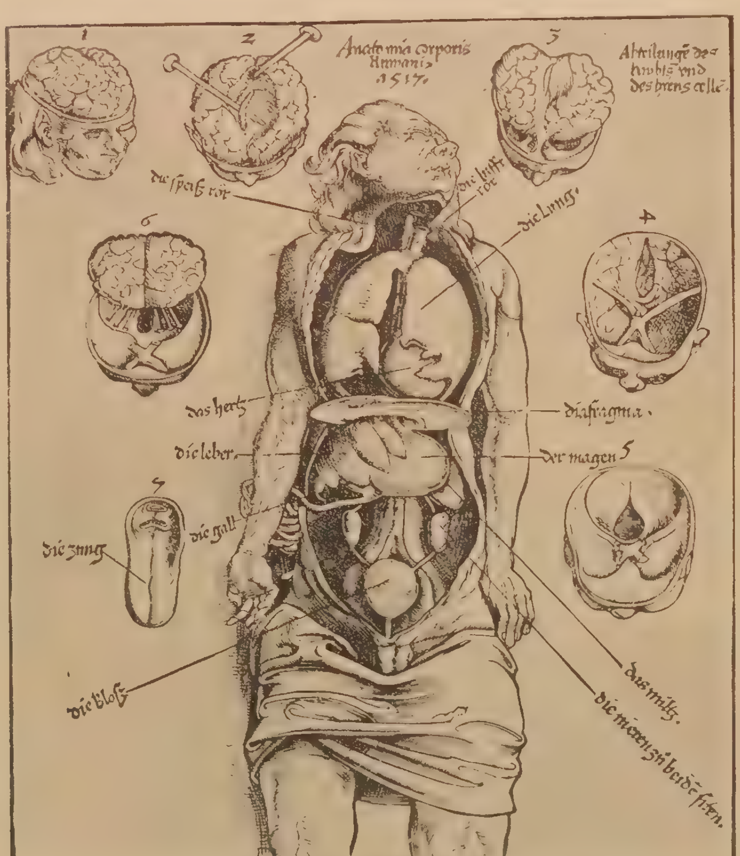


Fig. 37.

Anatomical sheet by WENDELIN HOCK published by JOHANN SCHOTT of Strasburg in Gersdorff, *Feldtbuch der Wundartzney*, 1517, and in Phrysius *Spiegel der Artzney*, 1518. It is remarkable for the six diagrams of the brain and brain-case that are scattered round the central figure. As regards the central figure we note the attempt to portray the lungs, of which the right shows two lobes, while the left exhibits the precordial gap. The diaphragm is a mere horizontal disc under which is the liver with its five finger-like lobes. The stomach is almost spherical. The kidneys, which lie very low, are joined by short ureters to the bladder, which lies very high.

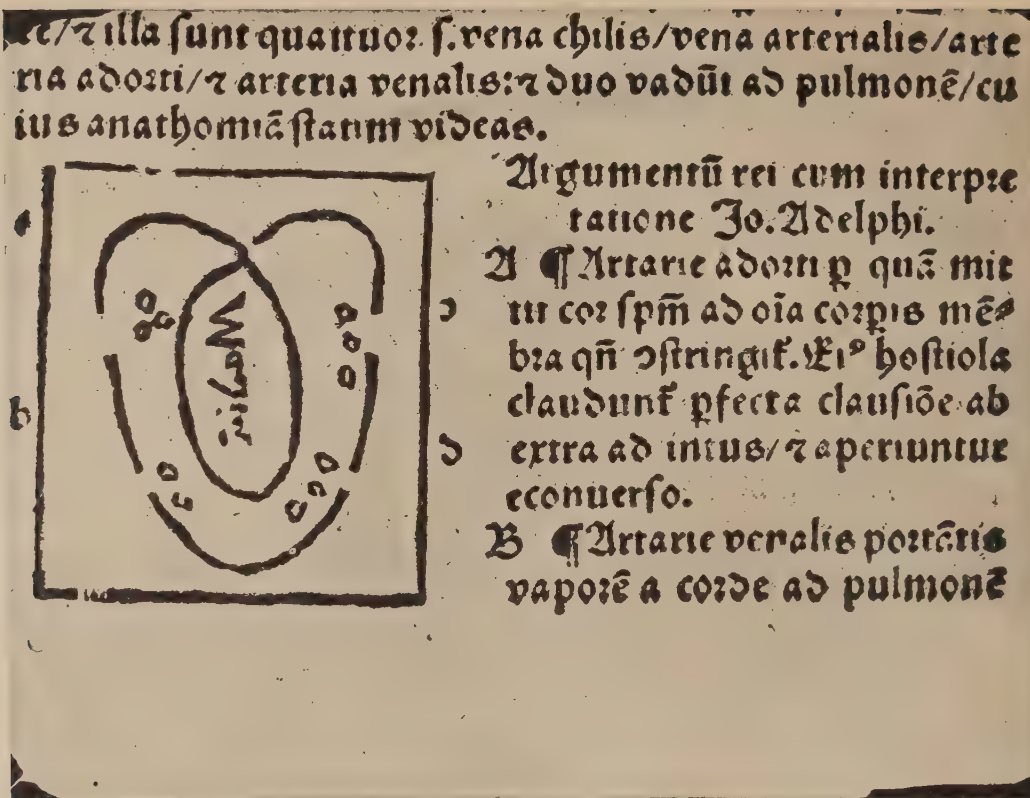


Fig. 38.

Diagram of the heart from the edition of MONDINO's *Anathomia* published by JOHANNES ADELPHUS at Strassburg in 1513. The name of this same ADELPHUS appears as the „Korrektor" of the first edition of Eucharius Roslin's *Rosengarten* which also saw the light in 1513. The diagram shows the *three* cardiac ventricles of mediaeval radition. Of these the middle is marked *medium*, The writing of this word is reversed but can be read by looking through the paper, from the other side. Valves are obscurely indicated at the four orifices of the two lateral ventricles.

MONDINO DE LUZZI, whose work ADELPHUS had thus edited, was born about 1275 near Bologna, and died there in 1326. He became a professor at the University of Bologna and performed a number of post-mortem examinations. About 1315 he demonstrated publicly on two female corpses. It cannot be said that his anatomical investigations set forth any discoveries but he occupies an extremely important position in the history of anatomy, since he was the first since GALEN to put together an anatomtcal work based on, or at least controlled by, personal observation. His book is thus of absorbing interest to the historian of anatomy. It is of additional importance by reason of its nomenclature. The mediaeval anatomical vocabulary, which is well set forth by MONDINO, was derived mainly not from Latin and Greek, as is ours, but from Arabic. Thus the *peritoneum* is the *syphac*, and the *oesophagus* the *meri*. Very few Arabie anatomical terms have survived into our own vocabulary. One of them, however, is the word *Nucha*.

Fig. 39.

Medal, probably portraying MARCANTONIO DELLA TORRE. From Möhsen, *Medaillensammlung* I. p. 219. MARCANTONIO was born at Verona in 1473, and received the title of doctor in 1521. He became a professor at Padua and died of the plague in 1512. It had been his purpose to produce a work on Anatomy and he applied to the great artist LEONARDO DA VINCI (see Fig. 42) to illustrate it. The text of this work, if it ever existed, has been lost. It is not improbable that many of LEONARDO's surviving anatomical drawings were prepared for this book. Had the work appeared, MARCANTONIO, and not VESALIUS, would have been the reformer of Anatomy.

Fig. 40.

Heart from Giacopo Berengario da Cappi *Isagogae breves pellucidae in Anatomiam humani corporis* Bologna 1523.
The left ventricle is opened exhibiting the *ostiolae* or valves at the root of the aorta. There is also seen the left *nervus reversivus* or recurrent laryngeal nerve, turning round the *circulus* or arch of the aorta. To the right of the figure may be seen the *auricula sinistra* represented as a spiral body. Berengario was the first to describe the vermiform appendix, the first to see the arytenoids as separate cartilages, the first to recognise the larger proportional size of the chest in the male and of the pelvis in the female and the first to give a clear account of the Thymus gland.

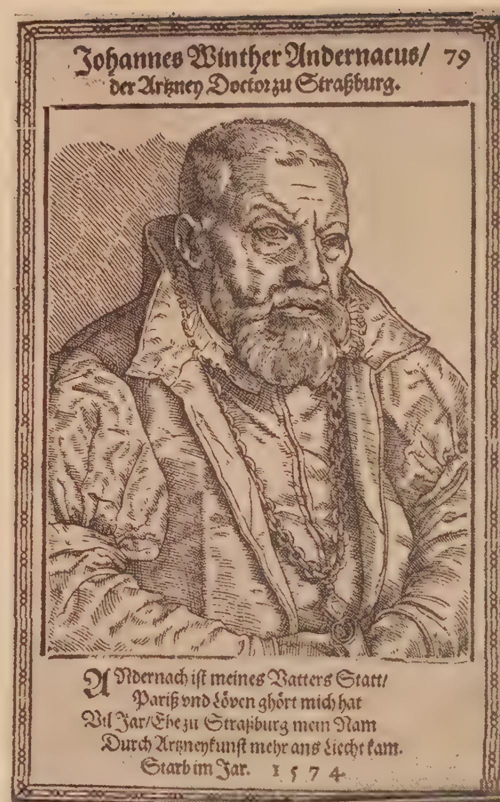


Fig. 41.

Johannes Guinther of Andernach 1487—1574. Guinther taught at Paris and Louvain where he had as students Vesalius (Fig. 49), Servetus (Fig. 75) and Rondelet (Fig. 43). He was a fine Greek scholar and translated into Latin the important treatise *On anatomical procedure* of Galen. Some of his works show the influence of Vesalius of whom he speaks in very high terms. Guinther influenced Anatomy much more through his pupils than through his writings.

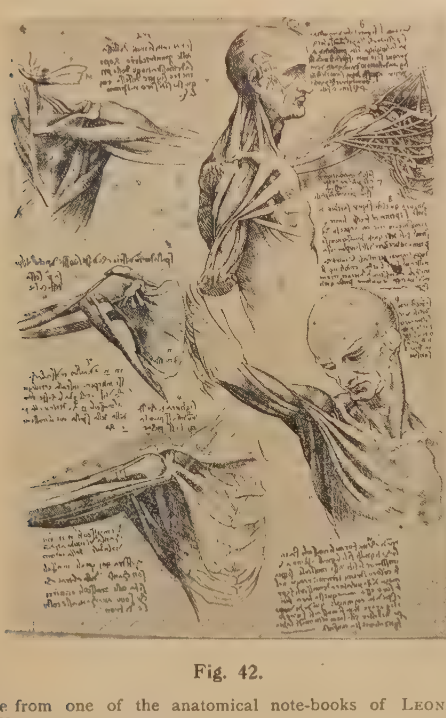


Fig. 42.

Page from one of the anatomical note-books of Leonardo da Vinci, 1452—1519.
The librarian of George III unearthed these note-books in the Royal Library at Windsor Castle where they had lain since the XVIIth century. William Hunter realised their value and interest and published a few leaves from them. The whole collection has been reproduced in facsimile in recent years.

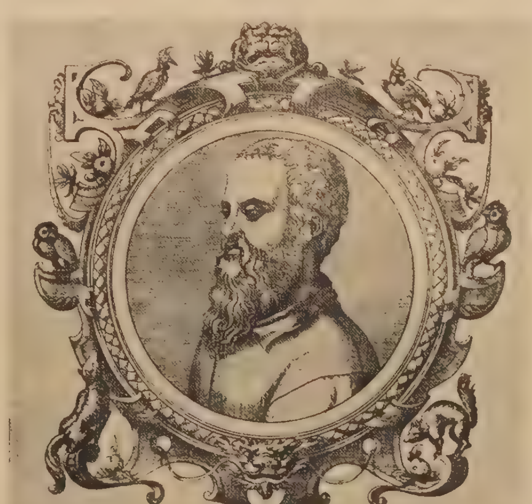


Fig. 43.

Guillaume Rondelet, 1509—1566.
Rondelet was professor of Anatomy at Montpellier where he founded the anatomical theatre. He is the *Rondibilis* of Rabelais. He is said to have been so enthusiastic an anatomist that he dissected the body of his own son.

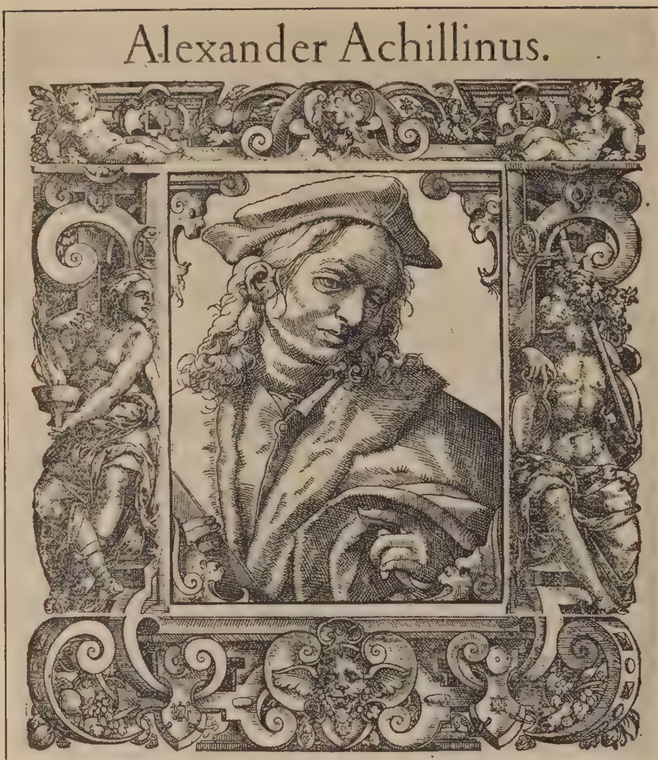


Fig. 44.

ALESSANDRO ACHILLINI 1463—1512.
ACHILLINI was professor both at Bologna and Padua. He described WHARTON'S duct a century and half before WHARTON. He re-described the infundibulum, observed the inferior cornua of the interior ventricles and rediscovered the fornix. He gave improved descriptions of the coecum, duodenum, ileum and colon. It is often said that he described the malleus and incus, but this seems to be an error.

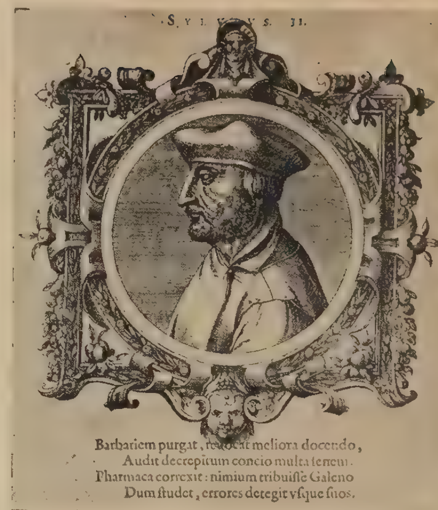


Fig. 45.

JACQUES DU BOIS (JACOBUS SYLVIUS) 1478—1555.
SYLVIUS was famous for his learning, especially in the works of GALEN, and he drew very large audiences to his anatomical lectures at Paris where he began to teach in 1531. He seems to have been among the first to practice anatomical injection. His chief work in anatomy was in the department of nomenclature. He gave their names to the *jugular*, *subclavian* and *renal* vessels, and is said to have been the first to see the valves in the vena cava inferior. The *Aqueductus Sylvii* is called after him. He introduced the term *corpus callosum*.

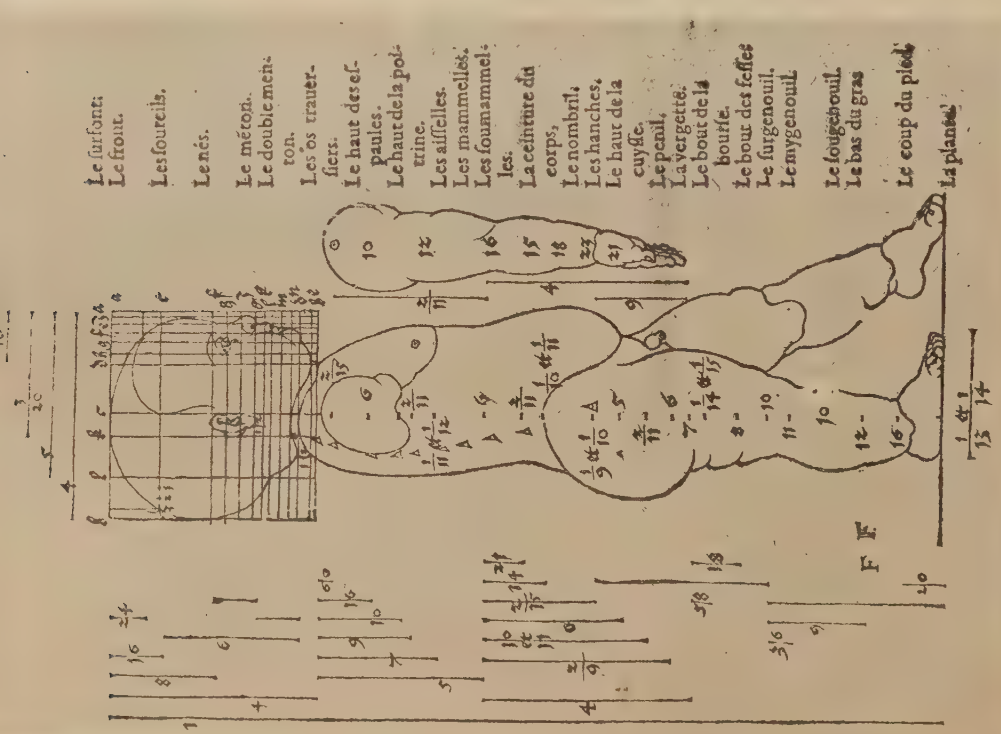


Fig. 46.

Proportions of the body of the child, as set forth by ALBRECHT DÜRER (1471—1528) in his *De symmetria partium humanorum corporum*, Nuremberg, 1528. The figure is taken from a slightly later French translation.
DÜRER was an artist who gave an immense amount of attention to the canon of proportion. In this book he recorded a vast number of measurements made on bodies of different type, age and sex. The work was intended primarily for artists. The figure here reproduced gives the measurement of a great number of parts of the infant placed by the side of the figure.

Fig. 47.

The nervous system, from CHARLES ESTIENNE, *De dissectione partium corporis humani*, Paris 1545.
CHARLES ESTIENNE (1503—1564) was a pupil of SYLVIUS and belonged to an eminent family of Protestant humanists. He died in prison. Part of his anatomical work was prepared as early as 1530. His work thus really preceded that of VESALIUS. ESTIENNE was largely dependant on GALEN. His best work is on the joints but he also enlarged osteology and myology. Moreover he differentiated between the white and grey matter of the brain and described the phrenic nerve. He was the first to trace blood vessels into the substance of bone. He observed the canal in the spinal cord, a most remarkable achievement at that date. That his figures lack clearness and beauty is well brought out by that before us.

Fig. 48.

The thoracic organs from CHARLES ESTIENNE, *De dissectione partium corporis humani*, Paris 1545.
The thorax is open and the heart and lungs removed. The arch of the aorta is seen with the vagus nerve, A and B, on either side, and the recurrent laryngeal nerve on the left. The pleura is shown turned back at D and the oesophagus at C, penetrating the diaphragm E. At the foot is a very poor figure of the diaphragm, showing the membraneous part at A, the foramen for the oesophagus at B, that for the aorta at C and that for the vena cava at D.
A horizontal white line across the middle of the head can be traced into a square that encloses the opened breast. Nearly all the figures of ESTIENNE have been thus treated. The explanation is that the plates were originally intended for another book, and that pieces have been cut out of each of them and replaced by others for this particular purpose.

Fig. 49.

ANDREAS VESALIUS, 31st Dec. 1514—15th Oct. 1565, from the painting in the Medical Museum in Amsterdam, perhaps by STEPHEN VAN CALCAR, The name of VESALIUS will always be associated with the revival of anatomy in modern times. The movement unquestionably owes more to him than to any other man He led the revolt against GALEN, and he it was who showed that GALEN's anatomy was that of animals and not of men. He had the courage of his opinions and had figures prepared direct from the object to demonstrate the truth of his views. He taught from the dissected human body. His first illustrated anatomical work, the so-called *Tabulae sex* of 1538, was prepared as an aid to his anatomical demonstrations. In the *Tabulae sex* he still draws the liver with five lobes, and copies many points of GALENIC anatomy. In his great work the *De fabrica corporis humani*, published at Basel in 1543, he has cast off the shackles of GALEN and appears as a bold and independant investigator. VESALIUS is the man who raised anatomy to a science. The entire book breathes a new spirit. He always has in mind the body as a whole and not merely the structure of the part he is investigating. It is this artistic point of view in him which has knit the volume, with its endless independent observations, into a beautiful and intelligible whole.

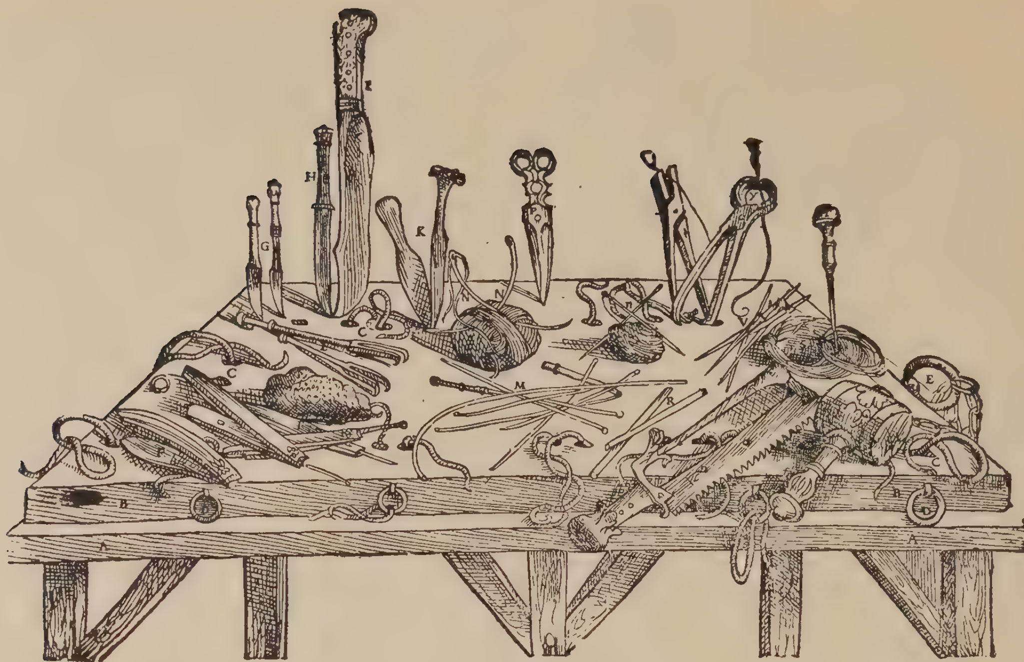


Fig. 50.

Table of dissecting instruments used by Vesalius, from the *De fabrica corporis humani*, Basel 1543.

Fastened to the edge of the table are seen rings with cords by which the animals to be dissected or vivisected were held in place. There are also holes in the table itself for a like purpose. On the table are placed knives, scissors, forceps, needles, awls, hammers, saws, sponges, razors, hooks and twine for use during the process of dissection.

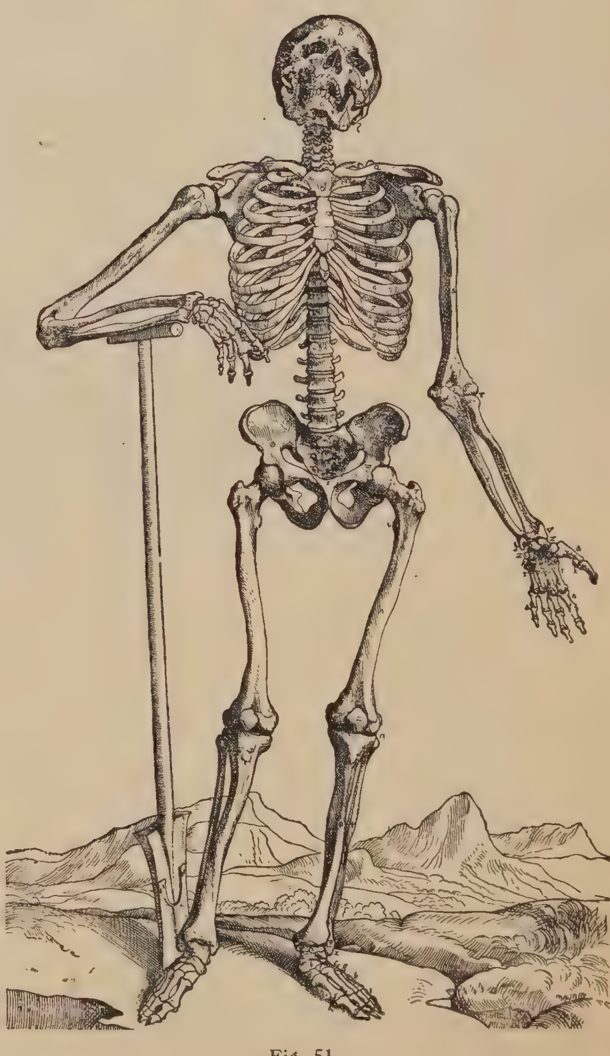


Fig. 51.

Not least of the distinctions of the great work of Vesalius is the dramatic and living impression that he succeeded in imparting to his figures. A fine example of this is the beautiful skeleton which forms one of the gems of the work.

Fig. 52.

The *Fabrica* of Vesalius is adorned with a series of large muscular figures of great artistic and scientific merit. They exhibit the muscles in a state of contraction and are, in fact, living anatomy. Vesalius, unlike Galen, was fully aware of the difference between nerves and tendons, and he showed how nerves and distributed to all the muscles. As regards the physiology of the vascular system, however, Vesalius did not advance very far from the Galenic standpoint though he expresses doubts as to the permeability of the interventricular septum.

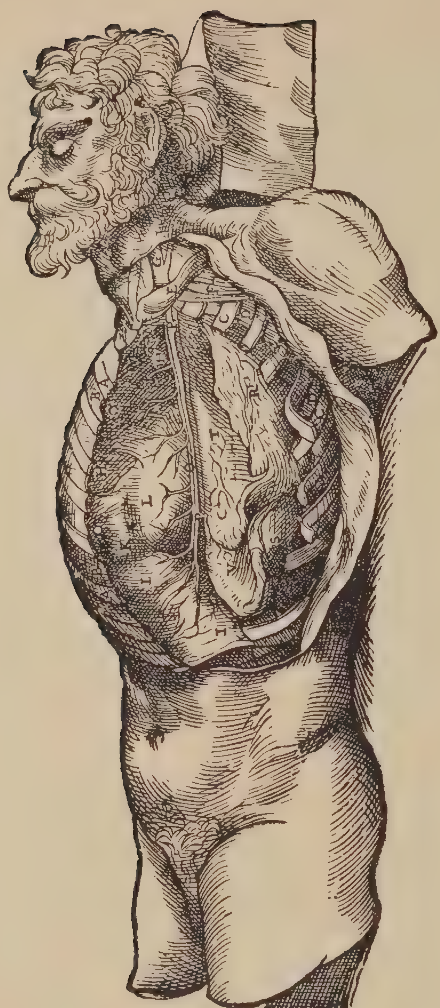


Fig. 53.

Fig. 54.

Thoracic and abdominal organs from the *Fabrica* of Vesalius.

The descriptions and figures of the internal organs by Vesalius are on the whole inferior to his treatment of the bones and joints, and of the muscular and nervous systems. The figure of the thoracic organs appears in many subsequent anatomical treatises. The phrenic vessels and nerves are conspicuous but it cannot be said that the details of the picture are very helpful or instructive. The abdominal organs in the text are passed over more cursorily than might have been expected but in many points the brief description is excellent. In the figure that we reproduce great emphasis is laid on the portal veins and on the vascular supply of the gall bladder, points in direct line with mediaeval tradition. We may note that the figure before us exhibits the vermiform appendix, a structure which, curiously enough, is not referred to in the text. Vesalius gave the first accurate description of the cardia and pylorus, of the omentum, liver and prostate.

The appearance of the *Fabrica* caused great stir in medical circles. The old question of the permissibility of dissection by Catholics was raised. The matter was specially discussed at the University of Salamanca and was determined in the affirmative.

Fig. 55.

Gabrielle Faloppio 1523—1562, Professor of Anatomy in the University of Padua, 1551—1562. Faloppio has left his name on an aqueduct and tube. He was remarkable for the extreme care of his researches. He dissected seven bodies yearly and on one occasion had the opportunity of examining the body of a criminal to whom he had administered a poisonous dose of opium. The case has given rise to a good deal of discussion. Faloppio described the acoustic and glossopharyngeal nerves, he discovered the drum of the ear, and the sinus petrosus, he gave an exact account of the muscles of the tongue and the sphincter of the bladder, and described the *vesiculae seminales* and the hymen.

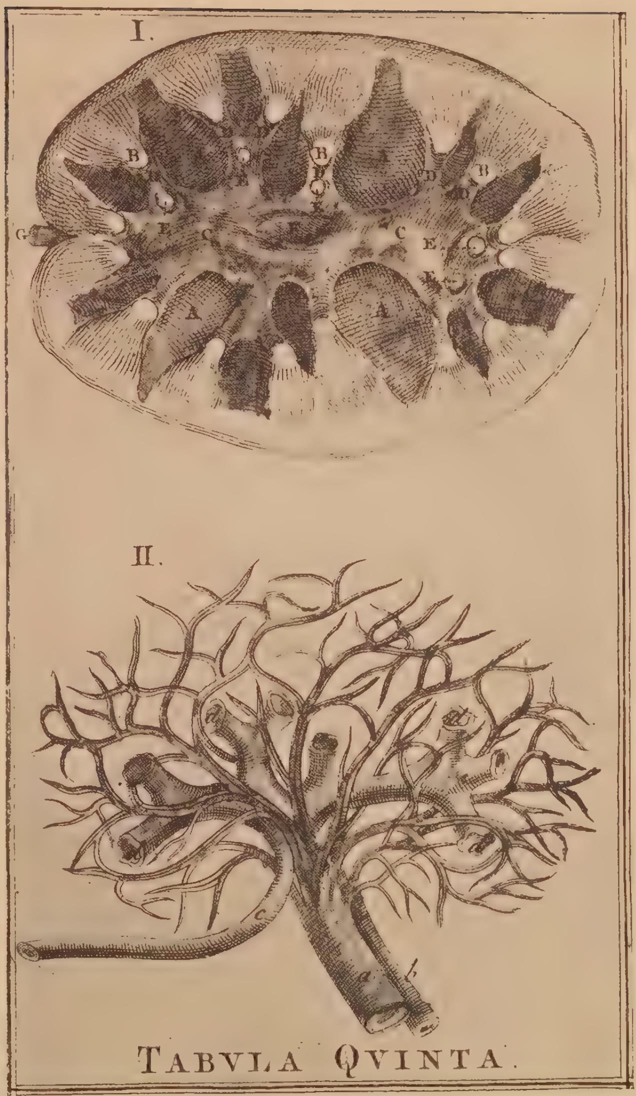


Fig. 57.

Structure of kidney from Bartolomeo Eustachio, 1520—1574.
Eustachio laboured in Rome, and his work — with certain minor exceptions — was not published in his lifetime. The splendid copper plates that he had prepared were, however, published by the papal physician, Lancisi (1655—1720), at Rome in 1714. Among the few figures published Eustachio in his lifetime are those of the kidneys. Eustachio attacks Vesalius for having represented the kidneys of a dog instead of man. The figure exhibits the pelvis of the kidney and the ramifications of the renal vessel. Eustachio made many anatomical discoveries, among the tube and valve associated with his name, and the *tensor tympani* muscle. He also made important investigations on the heart, brain and larynx.

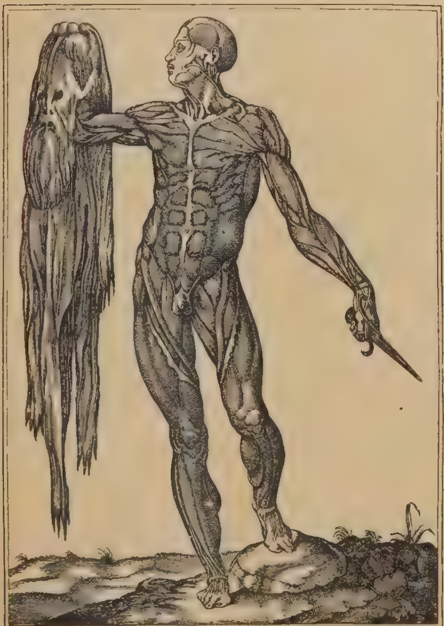


Fig. 56.

Title page of Juan de Valverde de Hamusco *Historia de la composicion del cuerpo humano*, Rome 1556.
Valverde was a Spaniard who studied at Padua and Rome under Colombo and Eustachio. Written originally in Spanish, his work was translated into Latin and Dutch. For the most part the figures are simply taken over from Vesalius. He included, however, a few original plates, and among them a fine muscleman. The muscleman is here represented holding his skin in one hand while with the other he grasps the knife with which the operation has been performed! (See Fig. 73).

Fig. 58.

Scene from title-page of Bartolomeo Eustachio *Tabulae Anatomicae* Amsterdam 1722, a reprint of the edition produced by Lancisi at Rome in 1714.
We see here the new form of dissecting room. The dissecting bench has four half circles cut out of it by which the operator can approach more closely to the subject. A circular bench for students surrounds the operator. The bodies of dogs lie on the foreground, and are evidently meant to suggest the failure of human material.

Fig. 59.

From Giovanni Filippo Ingrassias (1510—1580) *Commentaria in Galeni librum, De ossibus*, Palermo 1604.
Ingrassias was a Sicilian by birth. As an anatomist he still followed the text of Galen closely. He was nevertheless an independent observer, and added considerably to anatomical knowledge. He was a professor at Naples and he laid the foundation of modern osteology by his account of the completely assembled skeleton. The figure here presented shows well the relations of the hones of hand and foot. It exhibits also the ear ossicles and the hyoid bones of a man and of a dog. The claim has been made for Ingrassias that he discovered the Eustachian tube before the man whose name it bears.

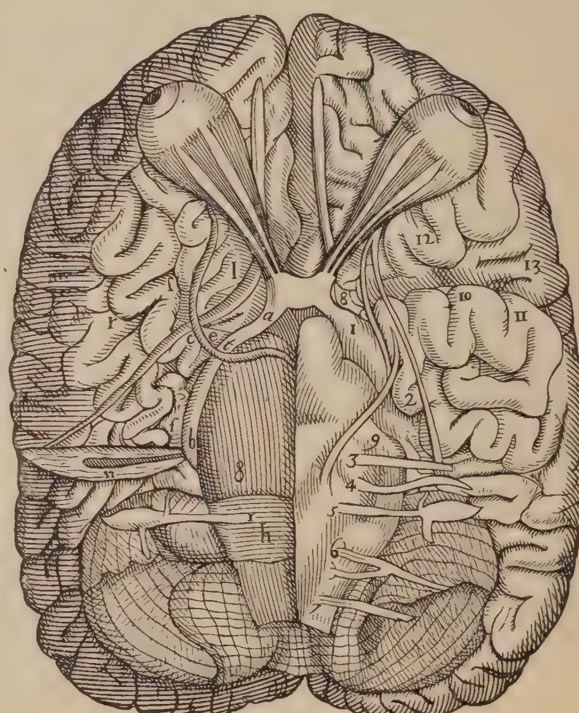


Fig. 60.

Base of brain from Costanzo Varolio *De nervis opticis nonnullisque aliis praeter communem opinionem in humano capite observatis* Padua 1573, reprinted with other pieces at Frankfurt in 1591. Varolio (1543—1578) was professor of anatomy at Padua and afterwards physician to Pope Gregory XIII. He occupied himself especially with the examination of the brain and nerves. Our figure shows below a tract marked with the letter *h* corresponding to what is now called the *pons Varolii.* He himself wrote of it *quam ego pontem cerebelli appello* „which I call the *pons cerebelli*" Varolio also described the cerebral commissures and the *crura cerebelli* in the same work, of 1573, in which this figure appears. We may note that this work was published without his permission.

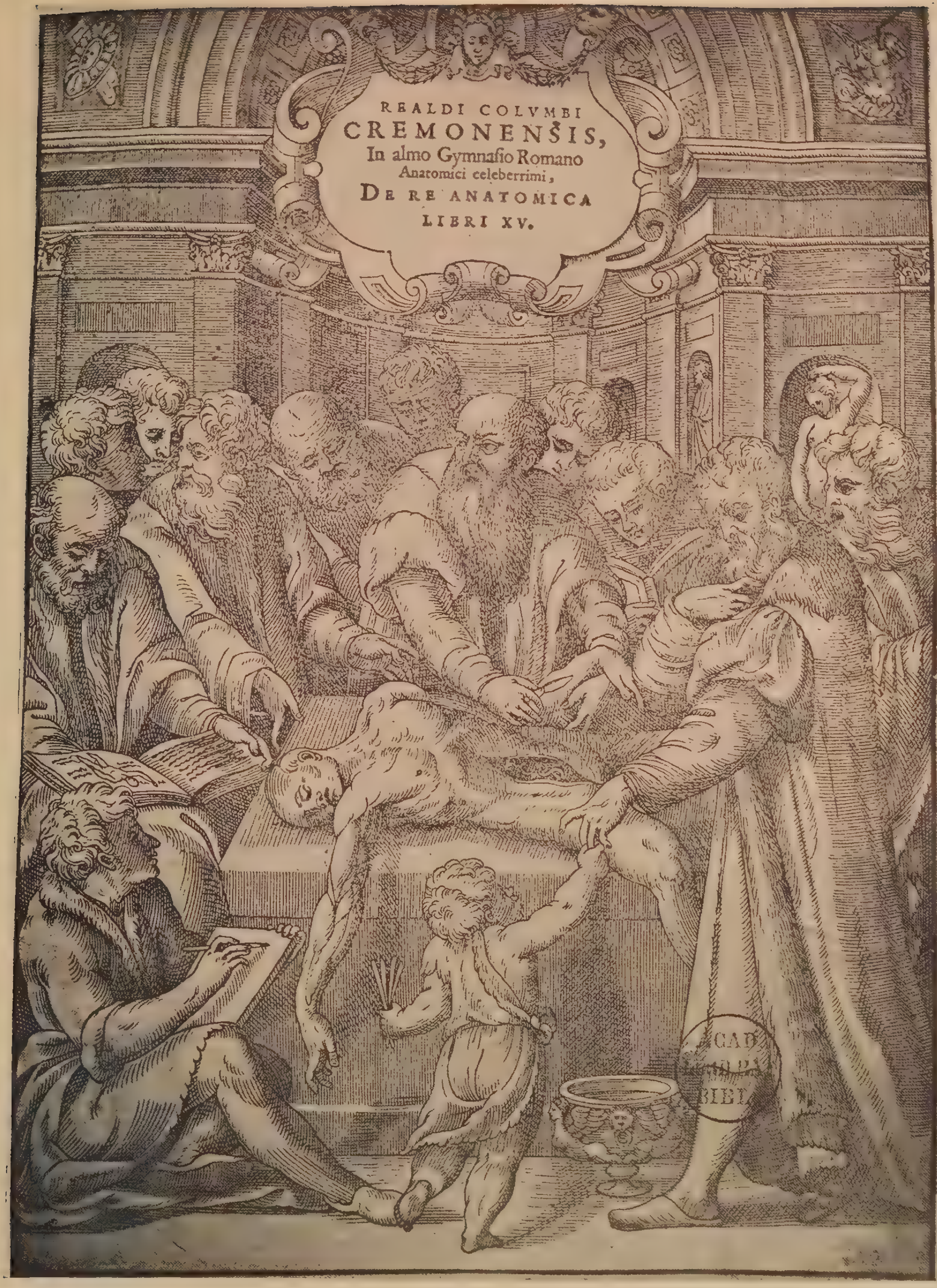


Fig. 61.

Titel page of MATTEO REALDO COLOMBO (1516?—1559), *De re anatomica,* Venice 1559.

COLOMBO was a pupil of VESALIUS, and succeeded his master as a teacher at Padua. His anatomical work appeared posthumously. The strongest point of his work is regional anatomy, and his description of the Mediastinum, Pleura and Peritoneum are far ahead of any that preceded him. He described the small bones of the ear — already known to BERENGARIO and others — and the *nervus trochlearis.* He wrote a good and clear chapter on vivisection. He has also a clear description of the lesser circulation, which his detractors have suggested that he borrowed from SERVETUS. In the figure before us we see that, like VESALIUS, he wields the knife himself and demonstrates from the object. He no longer reads from a book or sits in a chair while dissection proceeds.

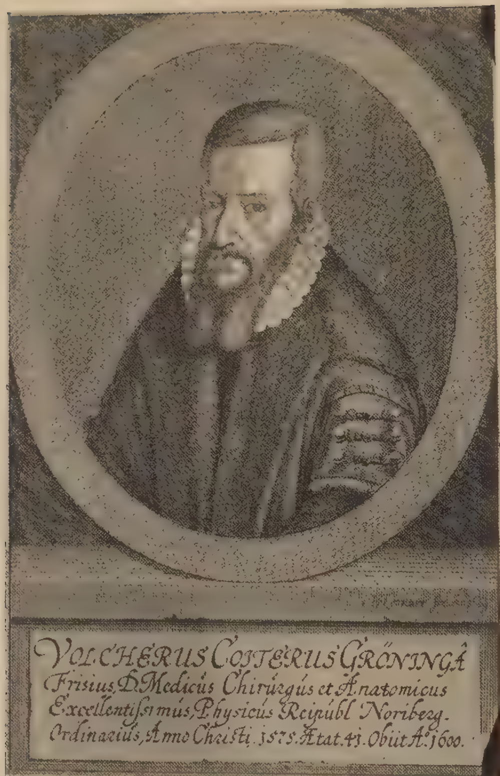


Fig. 62.

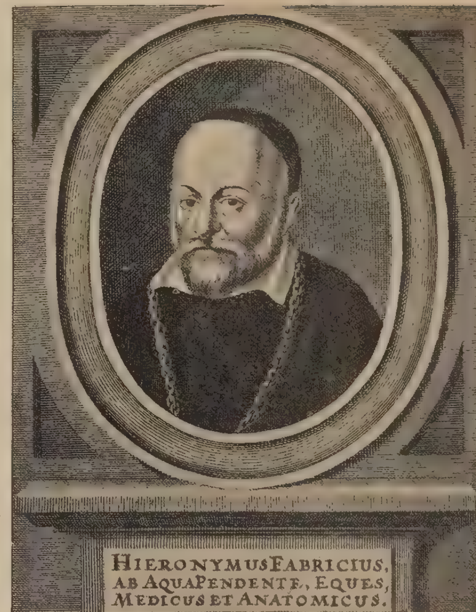


Fig. 63.

HIERONYMUS FABRICIUS of AQUAPENDENTE, 1537—1619.
FABRICIUS succeeded FALOPPIUS as professor of anatomy at Padua. He was an exceedingly successful and popular teacher and instructed most of the distinguished anatomists of the following generation, HARVEY among them. He was essentially a comparative anatomist. Among his best work are those on embryology, but particularly important for its influence on HARVEY was his work on the valves of the veins published in 1603 at Padua. FABRICIUS built, at his own expense, the anatomical theatre at Padua where MORGAGNI afterwards worked.

VOLCHER COITER (1534—1600) of Groningen.
COITER acted as surgeon in the French wars and later settled in practice at Nuremberg. The rarity of his books has prevented a proper appreciation of their very great value. He studied under FALOPPIO at Padua, under ARANZI at Bologna, under EUSTACHIO at Rome and under RONDELET at Montpellier. He had a clear conception of the comparative method in anatomy. He gave an excellent description of the organ of hearing. He began the study of embryology. He was also an experimental physiologist and records his observations of the living heart. He was the first in modern times to experiment by destroying parts of the nervous system and some of his conclusion in this department were confirmed by Fleurens in 1824.

GIULIO CESARE ARANZI (1530—1589) the teacher of COITER was a Professor at Bologna. He gave the first adequate printed account of the gravid uterus and its contents. In the course of this he describes the *ductus arteriosus* (later associated with the name of Botal) and the *foramen ovale*. He described the little nodules of cartilage in the semilunar valves to which his name is now attached.

Title-page of JOANNIS VESLING'S Syntagma anatomicum, Amsterdam 1659.
VESLING (1598—1649) was in 1627 „Incisor" at the medical college at Venice. In 1632 he was appointed professor of anatomy at Padua. VESLING is especially known through his work on anatomy which was translated in Several languages.

Fig. 64

Fig. 65.

GIULIO CASSERIO of Piacenza, 1561—1616.
CASSERIO was a pupil of FABRICIUS whom he succeeded as professor at Padua in 1604. He greatly extended anatomical knowledge, especially as regards the organs of voice and hearing. In his works on these subjects he proceeded along most scientific principles, taking full account of comparative anatomy.

Fig. 66.

From ANDRIAN VAN DEN SPIEGHEL *De formato foetu*, Padua 1626.
VAN DEN SPIEGHEL (1578—1625), known as SPIGELIUS, was like VESALIUS a native of Brussels, and like VESALIUS passed his active life as a professor at Padua where he succeeded FABRICIUS and CASSERIO. He has given his name to the *Spigelian lobe* of the liver. He introduced many anatomical refinements. His works are beautifully illustrated, but with plates which he inherited from CASSERIO. The figure which we here present shows the distribution of blood-vessels in the foetus. As with most of the figures of SPIGELIUS the subject is represented as displaying its own anatomy!

Fig. 67.

MARCO AURELIO SEVERINO, 1580—1656.
SEVERINO was professor of Anatomy in the University of Naples. He was one of the most famous teachers of his time and especially known for his researches in comparative anatomy. His most important contribution is his *Zootomia democritea*, Nurenberg 1645. It contains figures of the internal organs of a variety of animals, including invertebrates.

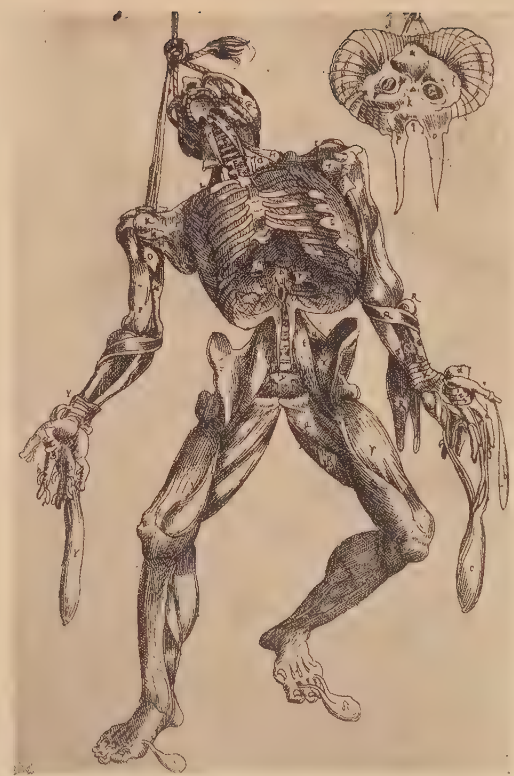


Fig. 68.

Muscleman from FELIX PLATER, *De corporis humani structura et usu*, Basel 1583.

PLATER (1536—1614) was professor of anatomy at Basel. The anatomical theatre was built in 1588 at his instigation. The figures in his anatomical work are, for the most part, exact copies of those of VESALIUS. This is the case with that here presented which is copied from the seventh muscleman of the *Fabrica* of VESALIUS. Apart from his zeal as a propagator of anatomical knowledge, PLATER is to be remembered for having corrected the views of VESALIUS as to the structure of the eye.

Fig. 69.

Colon and Caecum from CASPAR BAUHIN, *Vivae imagines partium corporis humani*, Frankfurt 1620.
BAUHIN (1560—1624) succeeded PLATER as professor of anatomy at Basel. He produced an excellent and scholarly text book of anatomy and introduced several anatomical terms which have remained in use. Among them are *areola* and *phrenic nerve*. He described and figured the ileo-caecal valve to which, however, FALOPPIO had already drawn attention.

Fig. 70.

Portrait medallion of SALOMON ALBERTI and his wife.
ALBERTI (1540—1600) was professor in the University of Wittenberg and later court physician. He drew his own plates for his work *Historia plerarumque partium humani corporis*, Wittenberg, 1583. He was an authority on the history of medicine. Anatomically his main contribution was on the structure of the lachrymal apparatus.

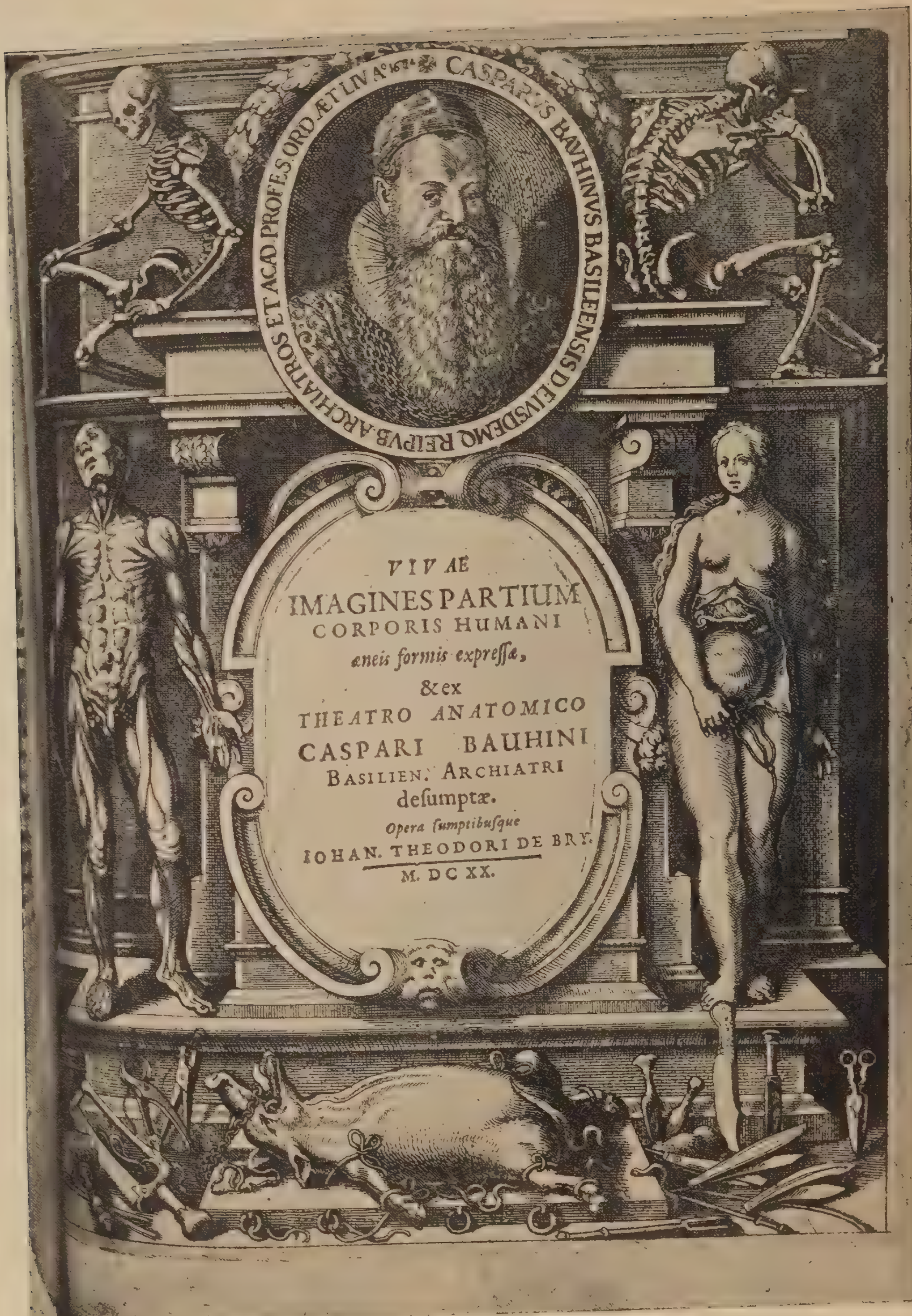


Fig. 71.

Titel page of Caspar Bauhin, *Vivae imagines partium corporis humani*, Frankfurt 1620. The illustrations of this work are reduced copies from Vesalius, Valverde Eustachio and Coiter and others, and are without artistic value. The work itself is however admirably compiled. The title-page shows the author's portrait in a medallion between two skeletons. Below stand two figures, the muscleman copied from Valverde, and the figure of the pregnant woman probably from Casserio. At the foot of the page is a pig on a dissecting board which, like the instruments that surround it, is taken from Vesalius.

Fig. 72.

Scene from title-page of PIETER PAAUW, *Primitiae anatomicae de humani corporis ossibus*, Leyden 1615.

PAAUW (1564—1617) was born in Amsterdam, studied under FABRICIUS at Padua and, returning to Holland, held a chair at the University of Leyden from 1589 till his death. He built there an anatomical theatre. A scene in that theatre is here reproduced. A dissecting table stands in the centre, and around it are ranged benches in tiers. Save during the progress of a dissection, the theatre was filled with a number of human and animal skeletons. These were cleared away during the dissection but one remains at the back holding a banner. PAAUW is recorded to have dissected sixty bodies.

The print here reproduced is from a copper plate by ANDREAS STOCKIUS. It came on the market also as a separate print and was utilized in other books, *e. g.* that by PLEMPIUS in 1663.

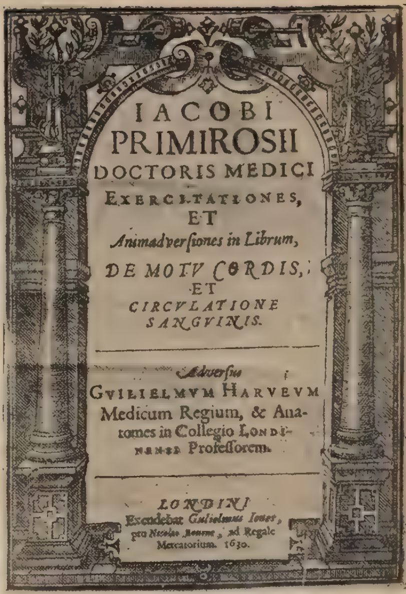


Fig. 78.

Titlepage of a work by James Primerose of Hull, published in 1630, and directed against Harvey. Primerose expresses contempt for the anatomical discoveries of the day which he regarded as in conflict with the teachings of Galen, whose authority he still accepted. One of the arguments that he used is that in the olden days patients were healed without the knowledge of the circulation, and that therefore this doctrine, even if true, would be useless!

Fig. 73.

Juan Valverde di Hamusco.
We have already referred to this man, the most distinguished of the Spanish anatomists (Fig. 56). He was of some importance in the history of anatomy as having supported the views of Vesalius as against the traditional anatomy of Galen. His principal work written in Spanish is his *Historia de la composicion del cuerpo humano*, which appeared in Rome in 1556. Note the decoration of the portrait with skulls and skeletons. On the pedestal are represented two small anatomical scenes. The print is one of the few known to be engraved by Nicolas Beatrizet.

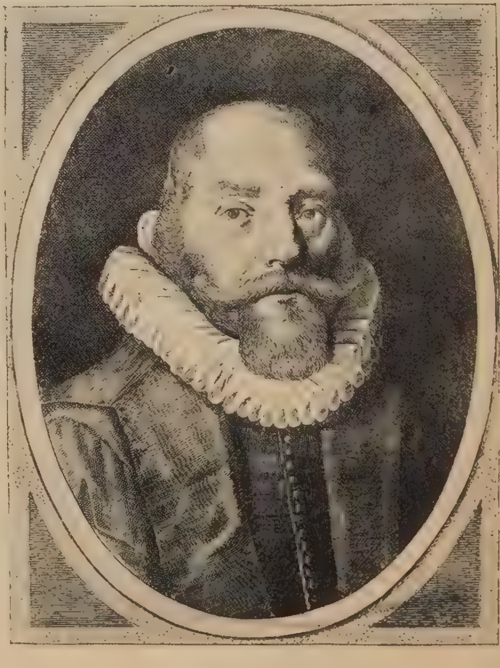


Fig. 74.

Pieter Paauw, 1564—1617, (see also fig. 72).
Paauw wrote on botany, edited Vesalius and was the author of a book on the plague. He edited a valuable edition of Hippocrates *On wounds of the head.* His most important contribution to anatomy is contained in his work *Primitiae anatomicae de humani corporis ossibus*, Leyden 1615. In it he describes the form of the skull in various races, Turks, Abyssinians, Greenlanders, etc.

MICHAEL SERVETUS,

Fig. 75.

MICHAEL SERVETUS, 1511 to 1553.
SERVETUS, or to give him his native name, MIGUEL SERVETO, was born at Tudela in Navarre. He studied medicine at the University of Paris, where he was perhaps a fellow student with VESALIUS (Fig. 49). He attended lectures by SYLVIUS (Fig. 45) and GUINTHER (Fig. 41). He succeeded VESALIUS as assistant to GUINTHER and aided GUINTHER in the preparation of a treatise on anatomy. He practised for a short time at Avignon and Charlieu, and then became physician to PIERRE PAULMIER, archbishop of Vienne. Here he remained for twelve years. His fatal correspondence with CALVIN opened in 1545 and he was burned as a heretic at Geneva on the 27th October 1553.
The *Christianismi restitutio* of SERVETUS was printed at Vienne in 1553. It is a theological work but refers in one passage to the lesser circulation. It denies the Galenic teaching that blood passes from the right to the left ventricle through the septum and correctly traces its course from the heart through pulmonary artery, lung and pulmonary vein, back to the heart. SERVETUS points out that the calibre of the pulmonary artery is too great to serve merely for the nourishment of lung, and in opposition to GALEN he names the lung rather than the liver as the place of elaboration of the blood.

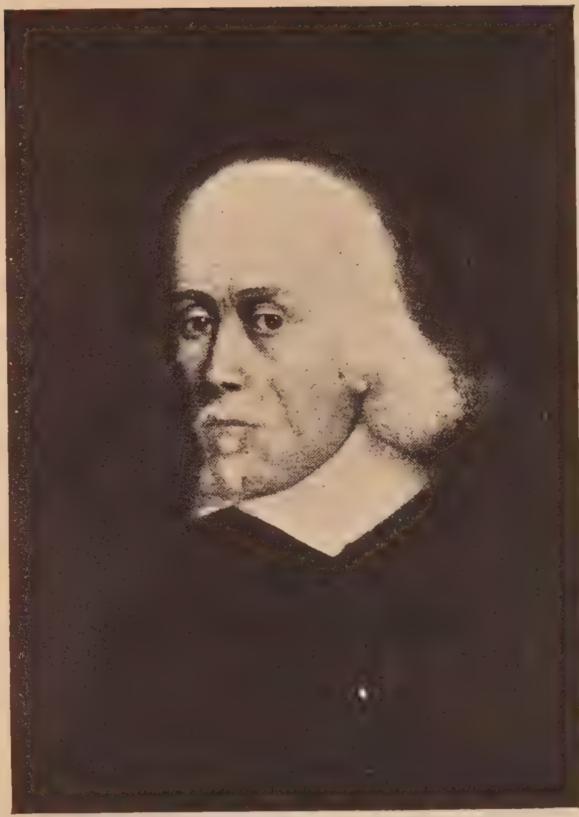


Fig. 76.

WILLIAM HARVEY, 1578 to 1658.
HARVEY was born at Folkestone, and was educated at Caius College Cambridge. The years 1597 to 1602 he spent at Padua where he was a pupil of FABRICIUS (Fig. 63), then at the height of his powers. CASSERIO (Fig. 65) was also teaching at Padua at the time. Returning to England HARVEY settled in London, where he became physician to St. Bartholomew's Hospital. He lectured at the Royal College of Physicians in the years 1615 and 1616 and the notes of his lectures have survived. These show that at that date he had reached a clear conception of the circulation of the blood. He did not publish his views, however, until 1628. He attained to his conception of the circulation largely by taking into consideration the valves in the veins which had been described and figured by his master FABRICIUS, though they had been seen by various earlier investigators.

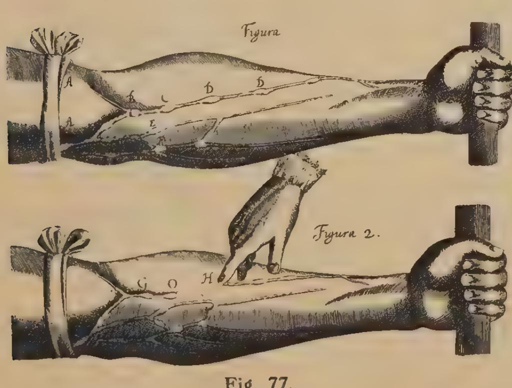


Fig. 77.

From W. HARVEY *Exercitatio anatomica de motu cordis et sanguinis in animalibus*, Frankfurt 1628.
The figure illustrates the action of the valves in the veins. *Figura 1* shows the effect on the veins of the forearm of a moderately light bandage above the elbow such as is used for venesection. The swellings B, C, D and E correspond to valves. *Figura 2* exhibits the effect of emptying a tract of a vein in a lightly bandaged arm. If the finger presses from O to H and is held at H, the tract OH does not refill, since the valve at O prevents this. If the pressure of the finger is removed from H, however, the tract instantly refills. Therefore it may be inferred that the veins fill from below not from above. This is one step in the very close reasoning by which HARVEY traces the course of the blood.

Fig. 79.

JEAN RIOLAN the younger, 1577 to 1657.
RIOLAN was professor of Anatomy and of Botany in the University of Paris, and court physician to Henry IV and Louis XIII. He was a violent opponent of HARVEY. RIOLAN in his *Encheiridion anatomicum*, Leyden 1648 accepted the doctrine of a partial lesser circulation through the lungs but denied that it was possible for the lungs to bear the pressure of all the blood. He maintained that the major part of the blood went through the septum of the heart from the right to the left ventricle. He maintained also, with the old physiology, that there were essentially two different kinds of blood. One of RIOLAN'S arguments against the circulation was that it would prevent the blood from parting with its food ingredients to the tissues on account of the rapidity of its motion. Working as a pure anatomist, RIOLAN made discoveries of some impotance despite his backward physiology. He described the mesentery and the spermatic vessels better than any previous writer. He also gave the first account of the embryonic gill-slits and the appendices epiploïcae. Above all he greatly improved anatomical nomenclature.

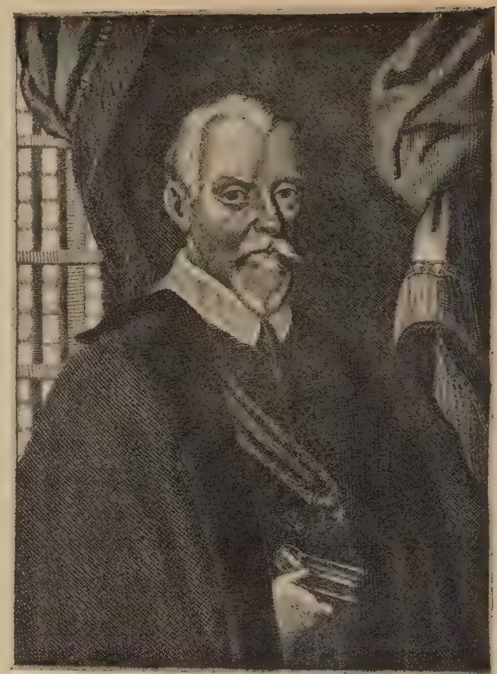


Fig. 80.

CASPAR HOFFMANN, 1572 to 1642, Professor at Nurenberg, had been a fellow-student of HARVEY at Padua. The two men retained a high respect for each other. HOFFMANN was not satisfied of the truth of the circulation of the blood. HARVEY therefore wrote to and visited him to put the case. HOFFMANN remained unconvinced, holding that the power put forth by the heart was insufficient to explain the phenomena. It is said that before his death he yielded to HARVEY'S arguments.

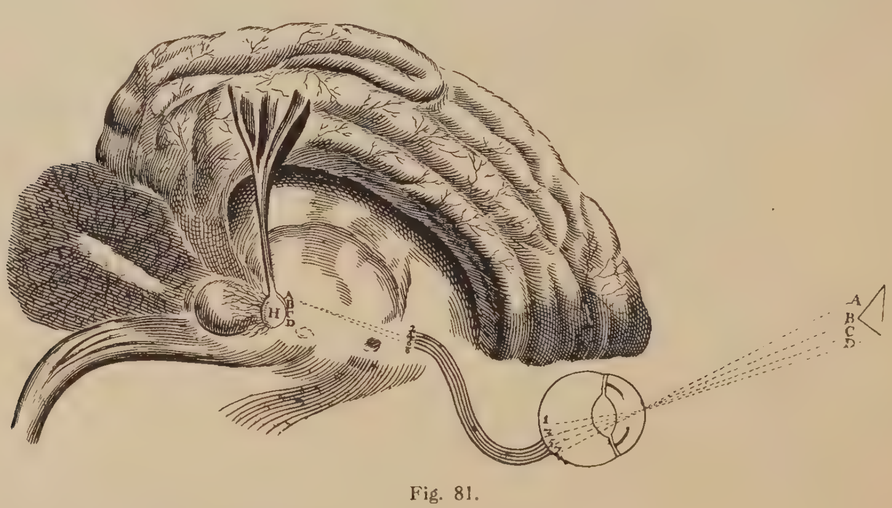


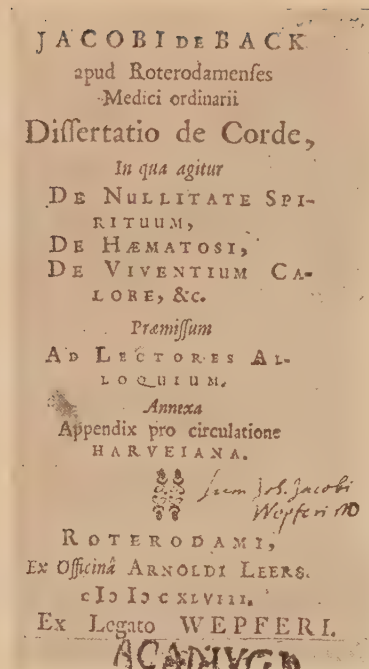
Fig. 81.

Diagram of the brain from RENÉ DESCARTES, *De homine*, Leyden 1664.
The great philosopher, DESCARTES (1596—1650), was one of the first to accept the doctrine of the circulation. He set it forth in his physiological text-book, *De homine*, which was not published till after his death but was written quite early in his career. DESCARTES considered that the movement of the heart, the central organ of the body, was brought about by the motion of vital spirits conveyed to it from the brain.
Our figure represents a diagram of the brain, optic nerve and eye. According to DESCARTES, images of external objects, thrown upon the retina, are there transformed into certain movements in the optic nerves The movements, transmitted along the optic nerve, ultimately reach the pineal gland, here marked H. The pineal gland is the seat of the soul. In the pineal gland movement (in the nerves) is transformed into sensation (in the mind). This process of transformation is the great and insoluble mystery of man's nature. We do not to-day attach the same importance to the pineal gland, but the mystery remains.

Fig. 82.

Title page of JAN VAN BEVERWYCK, *Alle de wercken zo in medicyne als chirurgie*, Amsterdam, 1652.

VAN BEVERWYCK (1594—1647) was born at Dordrecht where he studied, practiced and became professor and later Burgomaster. On 19th December 1637 he sent to HARVEY a letter testifying his agreement with his teaching. He was one of the earliest to do this. He used HARVEY'S drawings of the bandaged arm (Fig. 77) to demonstrate the action of the veins.



JACOBI DE BACK
apud Roterodamenſes
Medici ordinarii
Diſſertatio de Corde,
In qua agitur
DE NULLITATE SPIRITUUM,
DE HÆMATOSI,
DE VIVENTIUM CALORE, &c.
Præmiſſum
AD LECTORES ALLOQUIUM.
Annexa
Appendix pro circulatione HARVEIANA.
ROTERODAMI,
Ex Officinâ ARNOLDI LEERS.
CIƆ IƆ C XLVIII.
Ex Legato WEPFERI.

Fig. 83.

Titlepage of JACOBUS DE BACK, *Dissertatio de corde*, Rotterdam 1648.

DE BACK (died 1658) did much to propagate the views of HARVEY. In his book, of which we have here the title-page, he sets forth this doctrine and repudiates the idea of innate heat or of any process of boiling or effervescence in the blood. These were current doctrines before HARVEY.

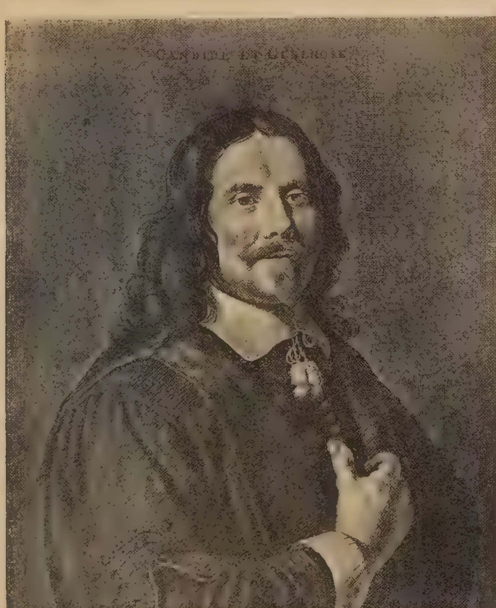


Fig. 84.

HENDRIK VAN ROY, 1598 to 1678.

ROY was a Professor at Utrecht. A student's dissertation, *Disputatio pro sanguinis circulatione* written under his supervision, led to an acrimonious controversy with PRIMEROSE, the opponent of HARVEY.

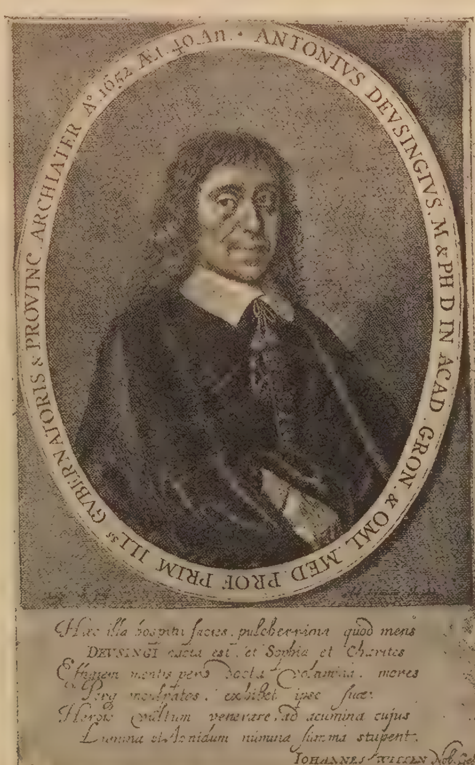


Fig. 85.

ANTONY DEUSING, 1612 to 1666.

DEUSING was Professor first at Harderwijk and then in Groningen. He was a man of great and varied learning whom HAESER describes as a "quarrelsome polyhistor". He was a prominent advocate of the doctrine of the circulation and defended it in his dissertation *De motu cordis et sanguinis*, Groningen, 1651.

Fig. 87.

FRANCIS DE LE BOE called SYLVIUS 1614 to 1672.
SYLVIUS was a professor at Leyden and a very influential teacher. He expressed his acceptance of the circulation of the blood in his lectures of 1639. Later he applied the doctrine to pathology, and was perhaps the first to do so. He was a good anatomists and an „aqueduct" and „fissure" are named after him.

Fig. 86.

VOPISCUS FORTUNATUS PLEMPIUS, 1601 to 1678.
PLEMP was a professor at Louvain and one of the early opponents of HARVEY. He set forth his objections in a letter to DESCARTES (Fig. 81) and VAN BEVERWYCK (Fig. 82). In PLEMP's view the doctrine of DESCARTES that the heart was provoked to contraction by something brought to it from the brain was refuted by the fact that the isolated heart may continue to beat. PLEMP later became convinced by HARVEY and expresses this in the second edition of his *Fundamenta medicinae* which appeared in 1644. He was a careful anatomist and described the supraciliary nerves for the first time.

Fig. 88.

Lazarus Riverius, 1589 to 1653.
Riverius was professor of medicine at Montpellier from 1622. He was one of the earliest and most prominent advocates of the doctrine of Harvey in France.

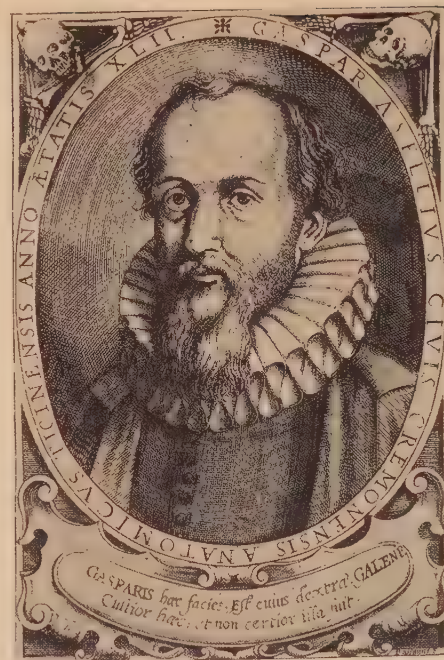


Fig. 89.

Gasparo Aselli, 1581 to 1626.
Aselli was professor at Pavia. On Juli 1622 he was vivisecting a dog to show the movements of the diaphragm. It happened that the animal had :ust consumed a meal containing fat. The intestines were seen to be covered with a multitude of white lines which Aselli first regarded as nerves. One of these was accidentally pricked and a white fluid exuded. He had discovered the lacteals. He confirmed his observation by numerous other experiments. He held that these vessels ended in the liver. A group of lymph glands at the root of the mesentery is still spoken of as the *pancreas Aselli.*

Fig. 90.

From Gasparo Aselli, *De lactibus sive lacteis venis*, Milan 1627. The letter B shows the lacteals in the mesentery and H the lacteals on the intestine. The lobes of the liver — correctly drawn as five, since a dog is used for the demonstration — are shown at O. The book is additionally interesting as the first anatomical work in which coloured illustrations are employed.

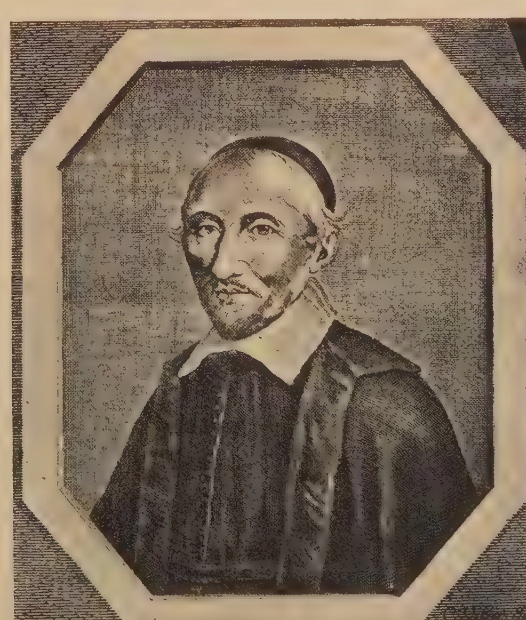


Fig. 91.

Pierre Gassendi, 1592 to 1655.
The French philosopher and mathematician, Gassendi, regarded the lacteals discovered by Aselli as blood vessels. He explained the white colour of the contents as due to the greater rarity of the blood corpuscles in the lacteals than in the other vessels. Gassendi in his work *De septo cordis pervio*, Leyden 1640, seems to be an opponent of Harvey.

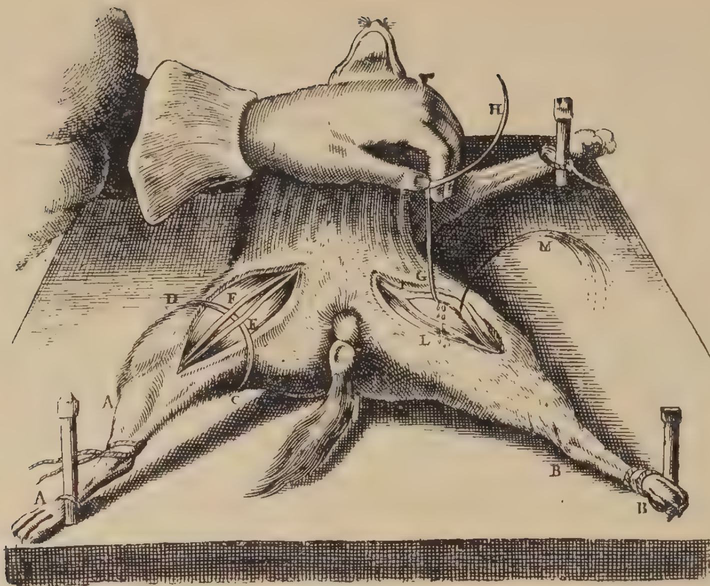


Fig. 92.

Johannes de Wale or Walaeus, 1604 to 1649.

Our figure shows a simple experiment made by Walaeus on a dog to confirm Harvey's doctrine. Walaeus shows that, whereas the blood will flow or even spurt from a vein below a ligature, it will do no more than ooze from a vein incised above a ligature.

Walaeus was converted to Harvey's doctrine by the teaching of Sylvius. In October and December 1640 he sent two letters to Thomas Bartholin (Fig. 95) in which he records a number of experiments confirming Harvey.

Fig. 93.

From Jean Pequet, *Experimenta nova anatomica, quibus incognitum hactenus chyli receptaculum, et ab eo per thoracem in ramos usque subclavios vasa lactea deteguntur*. Paris 1651.

Pecqet (1622—1674) discovered the receptaculum chyli in 1647 while he was still a student. The figure shows the opened body of a dog exhibiting the *receptaculum chyli* and entire course of the thoracic duct.

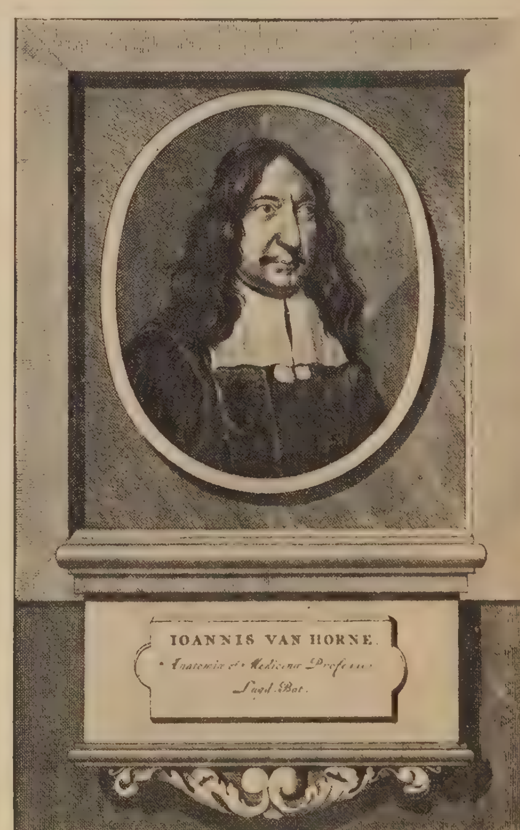


Fig. 94.

Jan van Horne, 1621 to 1670.

Van Horne was professor of anatomy at Leyden. The thoracic duct, described in animals by Pecqet, was demonstrated by Van Horne in the human subject. The discovery is announced in his *Novus ductus chyliferus* which appeared in 1652. In this work he shows that the lymph vessels come together at the level of the first lumbar vertebra and unite in a common channel which runs up through the thorax to the left subclavian. Van Horne's other anatomical work was mainly on the generative organs and especially the ovary.

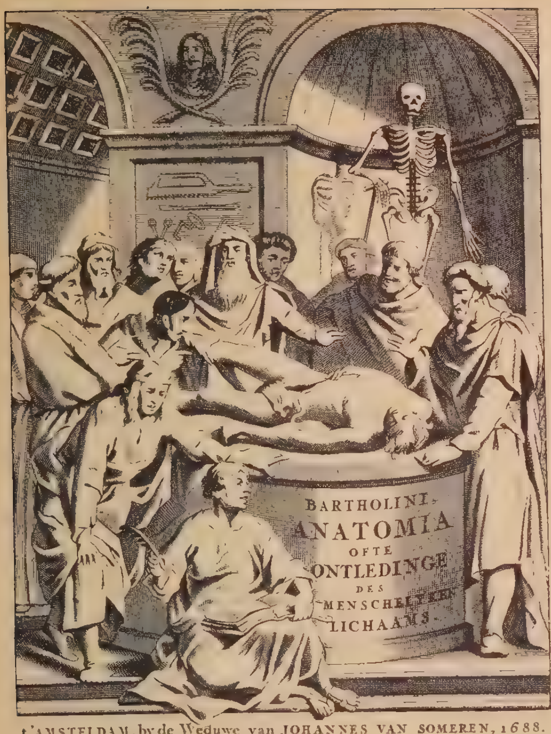


Fig. 95.

Title page of Thomas Bartholin, *Anatomia ofte ontledinge des menschelijken lichaams,* Amsterdam 1688.

Thomas Bartholin (1616—1680), was born at Copenhagen and became professor af anatomy in the university of that city. He was at once the most prolific and the most widely read of the anatomists of the seventeenth century. His text books were translated into most European languages and the titlepage here given is from a Dutch edition. In 1653 Bartholin discovered and described the lymph vessels The lacteals had been discovered by Aselli in 1627, and their relation with the *receptaculum chyli,* and the *ductus thoracicus* had been discovered by Pecqet in 1647, and described in 1651 The lymphatics had in fact been found by the Swede Olaus Rudbeck, (1630—1702) in the year 1650, while still a student at Padua. Rudbeck however did not make his discovery public until 1653, a few months after Bartholjn. The question of priority between Bartholin and Rudbeck gave rise to much controversy. In the Dutch version of Bartholin's work we see a dissecting scene in the background of which is a skeleton copied from Vesalius. The portrait of Bartholin stands on the column between palm branches.

Charles Drelincourt 1633 to 1697.

Drelincourt was born in Paris and studied there as a pupil of Riolan the younger. He succeeded Van Horne in 1670 as professor at Leyden and became the instructor of Boerhaave. Drelincourt was a fine anatomical teacher. It cannot be said that he made any great anatomical discovery but he excelled, in the opinion of his day, as an exponent of his subject. He also undertook experimental investigations. By ligating the veins of the abdominal viscera he demonstrated the direction of blood-flow in them, and he performed like experiments on the lacteals, He demonstrated the ramifications of the nerves and of the lymph vessels in the abdominal viscera, and he described the valve in the heart which has become associated with the name of Vieussens. The latter author and he gave an account of the glands in the epiglottis.

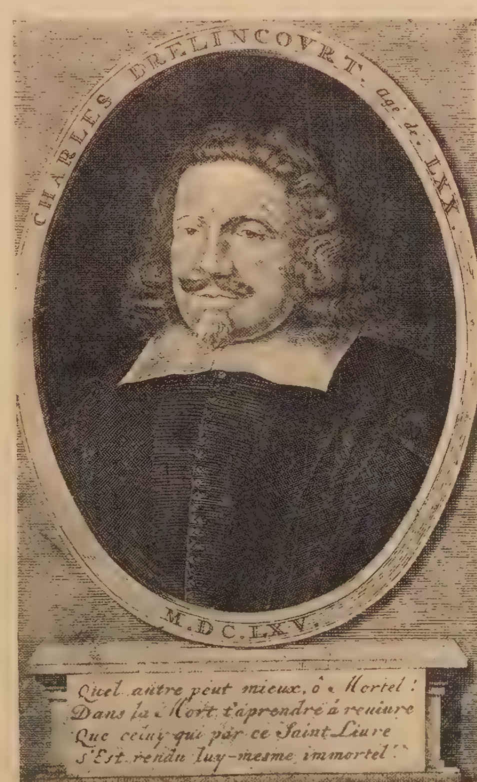


Fig. 96.

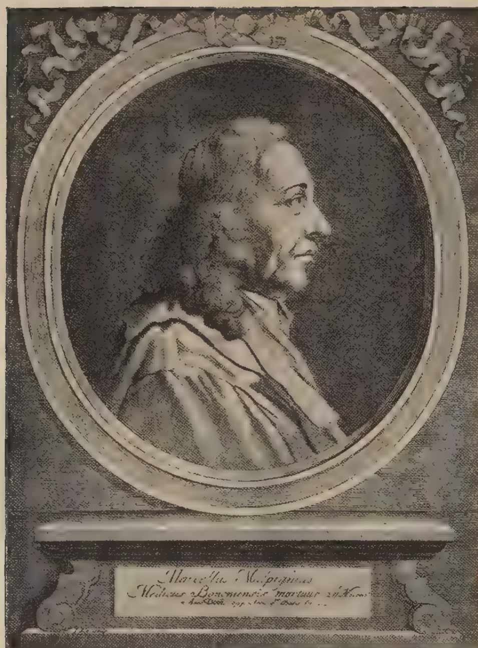


Fig. 97.

Marcello Malpighi, 1628 to 1694,
Malpighi was professor at Bologna and Messina and one of the most brilliant microscopical investigators of the seventeeth century. Among his most important discoveries was that of the capillary circulation. This he described in 1661 in the lung of a frog. In 1664 he published an account of the minute structure of the brain, and later he discovered the glands in the skin. The Malpighian layer and the Malpighian corpuscles commemorate him.

Fig. 98.

Anthony van Leeuwenhoek, 1632 to 1723.
This extraordinary man, though wholly without medical training and devoid of scientific education, made many important microscopic discoveries with his home-made microscopes. In one of his letters he tells us that „the blood vessels pour out no blood from their extremities, as some will still have it. These vessels have, in fact, no beginning and no end save in the heart. In spite of all that is said of arteries and veins they are in reality the same vessels. The only difference between them is that the so-called *arteries* carry blood from the heart and the so-called *veins* carry it to the heart.'' Leeuwenhoek watched the circulation of the blood in the tail of the eel & the web of the foot of the frog. He described the structure of bone and cartilage and of the teeth, of the skin, of the muscles and of the crystalline lens.

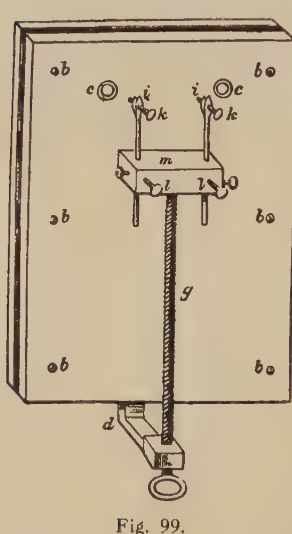


Fig. 99.

One of Leeuwenhoeb's microscopes.
Leeuwenhoek employed simple microscopes, the lenses of which were of exceedingly short focal length. The lenses were mounted in metal plates. The object to be examined was attached to a small screw mounted on a pin on the back of the metal plate. The object was focussed by turning the screw, and in certain cases a separate microscope had to be devoted to each specimen. Fig. 100 shows the lenses at *c c*. The eye had to be approximated to one or other of these. Fig. 99 shows the other side of the microscope. The objects were attached at *i i* and viewed by reflected light.
In 1677 Lodewyck van Ham, then still a medical student, at Leyden, discovered the spermatozoa. His discovery was confirmed and published by Leeuwenhoek a little later, This discovery drew much attention at the time, and gave rise to a school known as the *spermatists*, who believed the offspring was formed solely from the spermatozoon in which it was preformed. About the same period Regnier der Graaf (Fig. 102) discovered the mammalian ovum' and thus arose a school of *ovists* who saw in the ovum the preformation of the offspring. Leeuwenhoek opposed both these schools and held that the creature was not preformed at all in either ovum or spermatozoon.

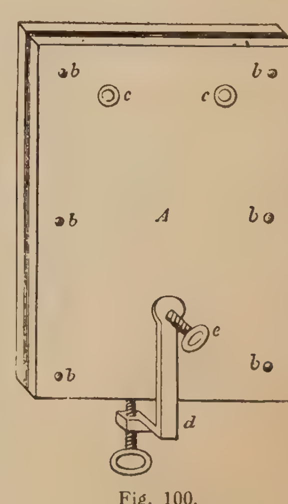


Fig. 100.

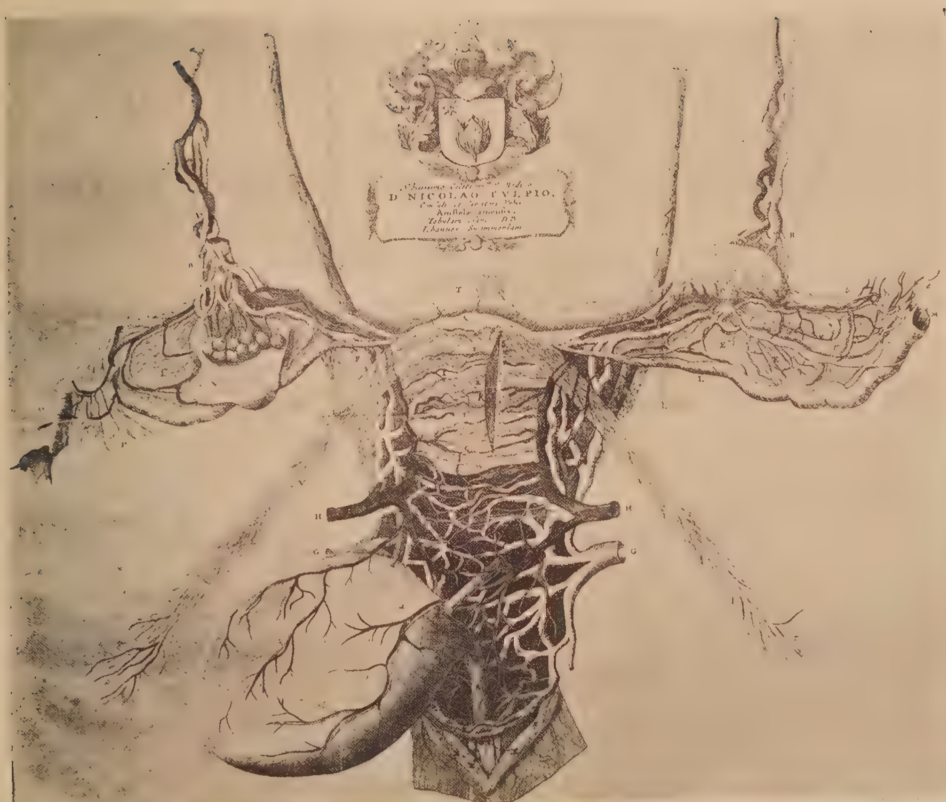


Fig. 101.

From Jan Swammerdam *Miraculum naturæ sive uteri muliebris fabrica*, Leyden 1721. Swammerdam (1637—1680) was a very fine naturalist and microscopist. In anatomy he is best known for his dissertation on respiration and for his examination of the lymph vessels. In his *Bible of Nature* he describes minute forms of life and the minute structure of larger forms. He adopted the method of injection by means which of he obtained admirable results.

Our figure is taken from a work of which the first edition, dedicated to Nicolas Tulp, appeared in 1672. It shows an injected anatomical preparation of the uterus and adnexa. Note the follicles in the right ovary. The process of making permanent anatomical preparations by means of injection was discovered in the XVIIth century. It was brought to greater perfection in the XVIIIth century. Domenico Marchetti (1626—1695) was perhaps the first to inject the vessels with solidifying fluid. He was soon followed by Swammerdam and Ruysch (Fig. 105). The anatomists of the day took immense pride in these preparations and paid more attention to their beauty than to their instructiveness (See e.g. Fig. 107). The exact composition of the materials used for these injections is unknown since each operator had his own recipe which he usually kept secret. They were mostly composed of a mixture of fats and of various kinds of colouring matter.

Fig. 102.

Regnier de Graaf 1641 to 1673.
De Graaf was a physician at Delft. He gave accurate descriptions of the female organs of generation in 1668 and of the male organs in 1672. In publishing the latter work he described the so-called *Graafian follicles.* His premature death robbed science of a very promising investigator.

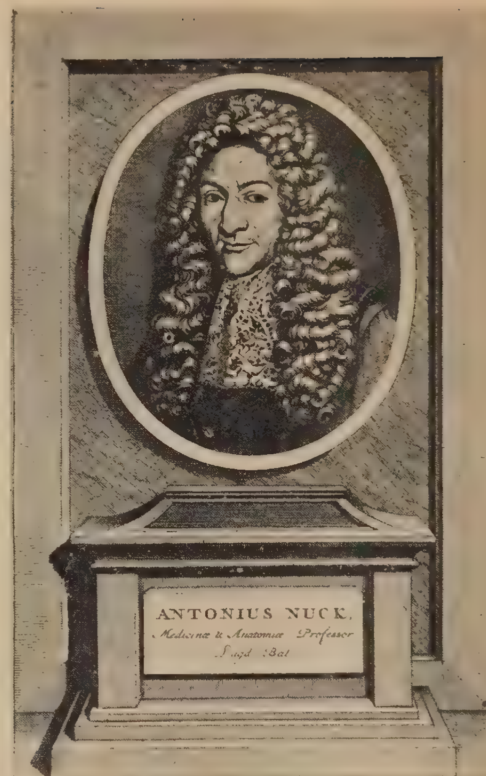


Fig. 104.

Antony Nuck 1650 to 1692.
Nuck of Leyden succeeded to the lectureship in anatomy there on the death of his friend Stalpart van der Wiel in 1683. He injected blood vessels with mercury. By mixing this with lead or tin he was able to obtain a solid amalgam. Natural models of the glands and of the lymphatic system could thus be obtained. He is commemorated in the *canal of Nuck.*

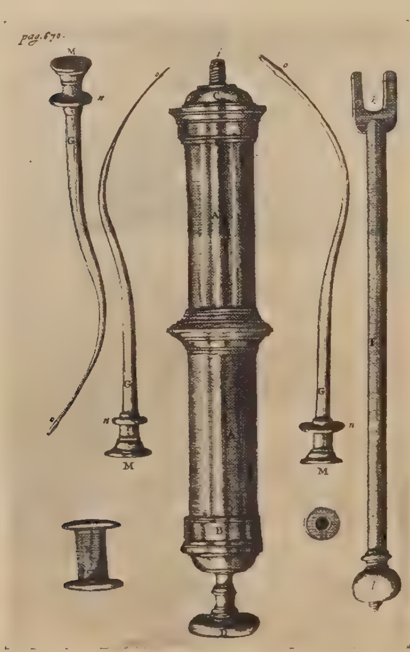


Fig. 103.

Syringe and other apparatus used by de Graaf to inject blood vessels, an operation in which he was a pioneer, having learned of it from Swammerdam.

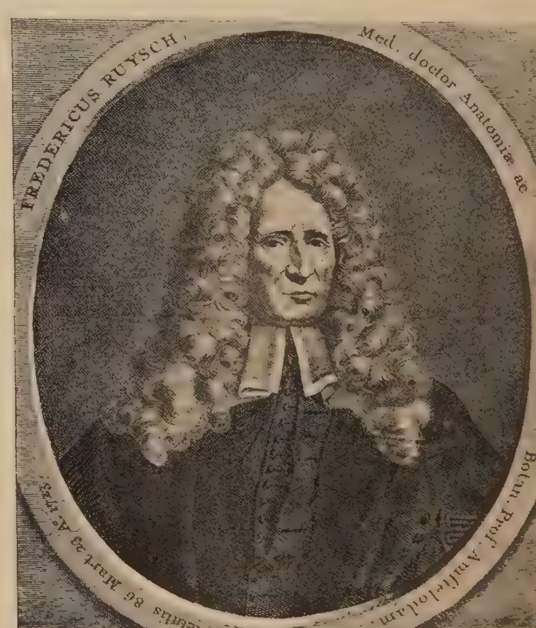


Fig. 105.

Frederik Ruysch, 1638 to 1731.
Ruysch was a pupil of Van Horne and Sylvius, and later became professor of anatomy at Leyden and Amsterdam.

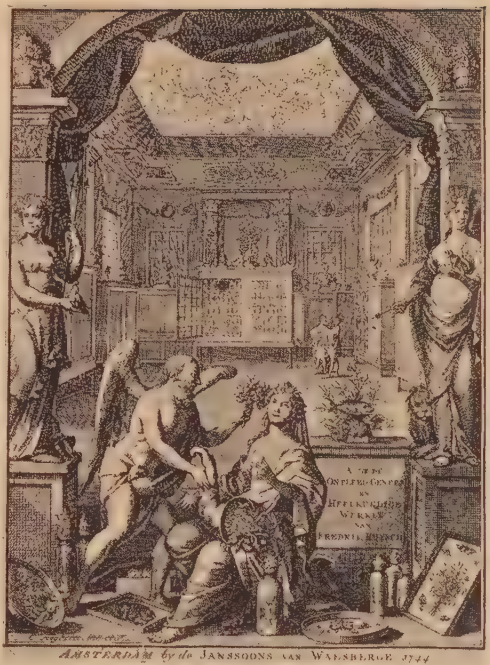


Fig. 106.

Title-page of FREDERICK RUYSCH, *Alle de Ontleed-Genees- en Heelkundige werken.* Amsterdam 1744. The print shows the hall in which he kept his collection. One of the cabinets is open, and on the bookcases are dried seaweed and corals. The collection of a „curiosity cabinet" was then a common custom of the learned. That of RUYSCH was a famous example. He attached enormous importance to the technique and beauty of his preparations, with the result that his collection, like his work, was more curious than instructive.

Fig. 107.

A group from RUYSCH's cabinet collected by him from a variety of sources. We see skeletons of foetuses, groups of injected intestines, testicles, salivary glands, insects, gall stones, sponges, renal calculi and a multitude of other things. RUYSCH became well-known for his injections of the vessels in anatomical preparations, an art which he had brought to great perfection. Many of his specimens were certainly very beautiful. RUYSCH sold his extensive collection in 1716 to CZAR PETER THE GREAT for 30,000 Guilders. A second collection which he had begun was sold after his death to King JEAN SOBIESKI, and was presented by him to the University of Wittenberg. So far as anatomical investigations go, we may connect the name of RUYSCH with the description of the valves on the lymph vessels, the bronchial arteries, the external intercostal arteries, the *arteria centralis retinae*, the periosteum of the small bones of the ear, and a circular band of muscular tissue in the *fundus uteri.*

The recipe for the material that RUYSCH used for injecting the vessels has remained a secret. It is known only that it was a fatty liquid, and that he used some corrosive to remove the surrounding tissues.

Fig. 107.

Fig. 108.

LORENZO BELLINI of Florence, 1643 to 1704.
BELLINI was professor of anatomy at Pisa. He was just eighteen when his much quoted but very obscurely written work on the structure of the kidneys was published. He followed it up by a book on the gustatory nerves. His portrait stands on a pedestal with an illustration in an inset, on which is to be read *ante me nemini*, in harmony with his vanity. He is commemorated in the *tubules of Bellini.*

Fig. 109.

GIORGIO BAGLIVI, 1668 to 1707.
BAGLIVI was professor of anatomy at Rome. In 1701 his first treatise *De fibra motrice et morbosa de anatome fibrarum, de motu musculorum et de morbis solidorum* was published. In this he distinguished the striated from the smooth muscle fibres. He ascribed the power of voluntary movement to the contraction of these striated fibres controlled by the nerves.

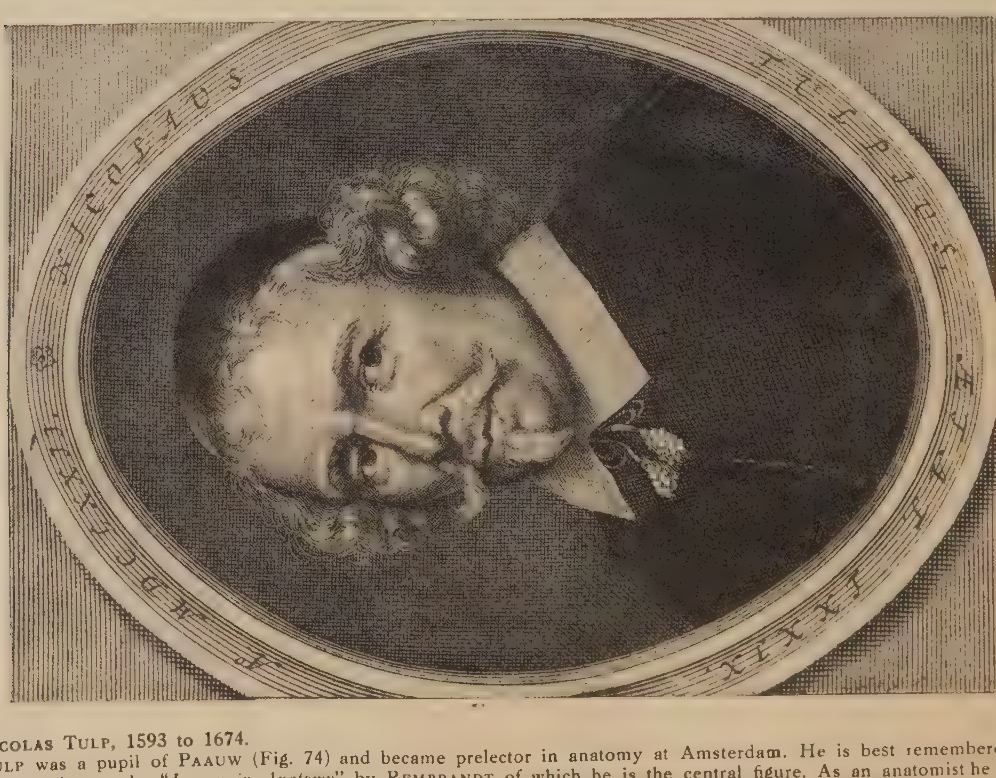


Fig. 111.

NICOLAS TULP, 1593 to 1674.
TULP was a pupil of PAAUW (Fig. 74) and became prelector in anatomy at Amsterdam. He is best remembered by the famous picture, the "*Lesson in Anatomy*" by REMBRANDT of which he is the central figure. As an anatomist he specially extended the knowledge of the spinal cord.

Fig. 110.

THÉOPHILE BONET, 1620 to 1689.
BONET was physician to the Elector of Neufchatel. He made many researches in morbid anatomy. He investigated the sense of taste and propounded the hypothesis that the tongue possessed a special nerve for each kind of taste, just as the ear has a special organ for every sound. BONET was a man of great learning, and is now chiefly remembered for his vast collections of the works of his contemporaries and predecessors.

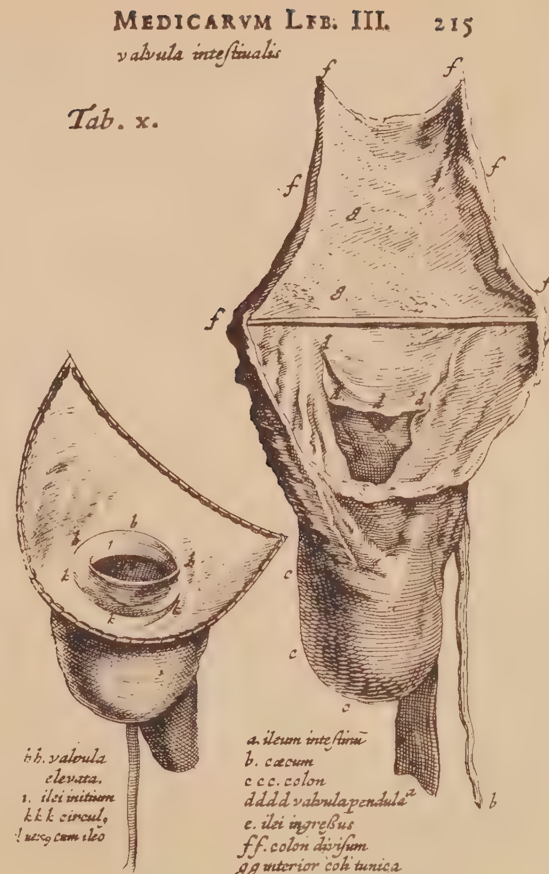


Fig. 112.

From NICOLAS TULP *Observationes medicae*, Amsterdam, 1641.
The figure shows the ileo-coecal valve. He demonstrated this structure to various colleagues, PLEMP among them, as early as 1632.

Fig. 113.

PHILIP VERHEYEN, 1648 to 1710.
The portrait appears as title-page to the edition of his Anatomy of 1726. The placing of a bust on a pedestal encircled by numerous allegorical figures is in accord with the taste of the time.
VERHEYEN was born in a small Belgian village. He was first farmer, then theologian and, after he had had a foot amputated, he became a physician and rose to be a professor at Louvain. His *Anathomia corporis humani* was nearly as popular as that of BARTHOLIN. He was a keen observer and a good critic.

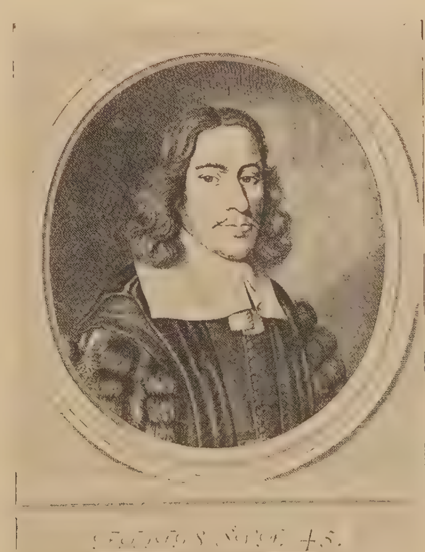


Fig. 126.

THOMAS WILLIS (1622—1675).
WILLIS practised in Oxford and afterwards in London. In 1664 he published a book which opened up new paths in anatomy and physiology. This was his *Cerebri anatome, nervorumque descriptio et usus*. It was the most exact account of the nervous system that had yet appeared. The *circle of Willis* at the base of the brain is still called after him. The ninth cranial nerve is still sometimes called the *accessory nerve of Willis*.

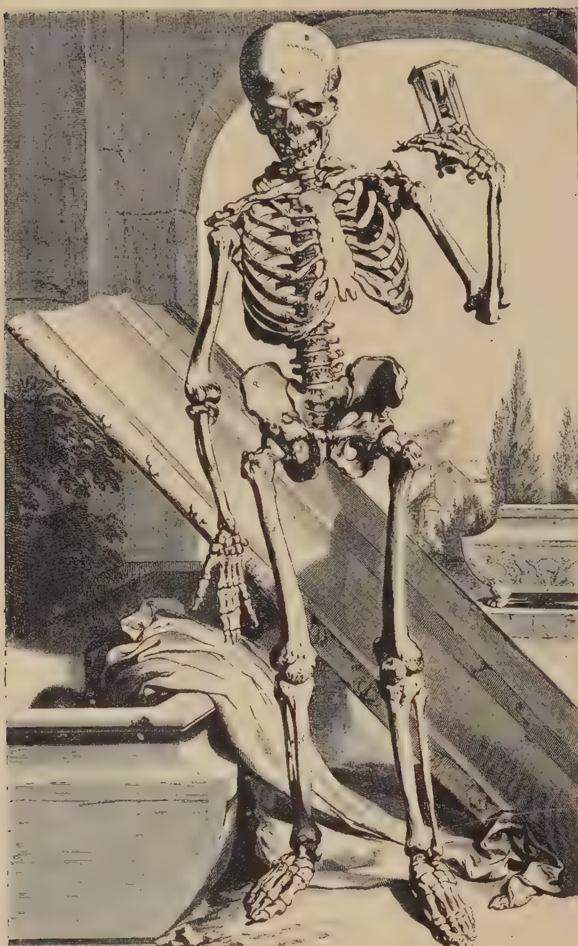


Fig. 114.

From the flyleaf of the great *Anatomia corporis humani* of Godfrey Bidloo, Amsterdam 1685. Bidloo (1649—1713) pursued anatomical studies with great industry. The figures for his atlas were the work of Gerard de Lairesse, one of the best engravers of the 17th century. The skeleton is here shown standing posed amidst appropriate surroundings, which, however, as in many of his figures, tend to distract the attention from the anatomical purpose of the picture. The plates from which these figures were prepared were later bought by an English firm, and were republished by Cowper under his own name (Fig. 128). Bidloo worked for nine years on his atlas. On the strength of it he was appointed in 1694 as professor at Leyden. He became court physician to William III and accompanied that monarch to England. In his anatomical preparations he injected the blood vessels with wax, plaster of Paris, mercury and a tin amalgam.

Fig. 115.

Otto Heurnius, 1577 to 1652.

Heurnius was the son of Johannes Heurnius (1543—1604), court physician to Prince William I and to Prince Maurice. Otto succeeded his father as professor of anatomy at Leyden in 1617. He founded the „collegium publicum" at Leyden, which was the first place where clinical instruction was earried on in North West Europe. Clinical instruction had been suspended at Padua after the death of Montanus in 1551. Clinical lectures were recommenced at Padua by Albertino Bottoni and Marco degli Oddi in 1578, principally as a result of the insistent demands of the students. Heurnius had the greatest difficulty in introducing clinical instruction, being opposed by the students. Boerhaave finally established clinically instruction and Germany and England followed this example.

Fig. 116.

CORNELIS VAN 's-GRAVEZANDE, 1631 to 1691.
's-GRAVEZANDE was anatomical prelector at Delft. CORNELIUS DE MAN painted him while giving a lecture on anatomy in the hospital at Delft. Our portrait, a black and white drawing by BLOOTELING, introduces the usual skeleton that became almost the coat of arms of anatomists. Note that the skeleton leans upon a spade, an idea very persistent in art and drawn from the example of VESALIUS.

Fig. 117.

Fig. 118.

Title page of STEPHANUS BLANKAART, *Nieuw-hervormde anatomie.*

BLANKAART (1650—1702), of Middelburg, succeeded in 1675 for the first time in injecting the capillary vessels. He thus obtained permanent and objective proof of the passage of the arteries into the veins. The title page represents BLANKAART in the foreground, performing a dissection. The benches for the spectators are arranged in the form of a theatre. Human and animal skeletons are still used as decorations. We note again a skeleton holding a spade in the VESALIAN tradition.

Title page of GERHARD BLASIUS, *Menschelijk Lichaam.*

BLASIUS was born at the beginning of the 17th century in a village bear Bruges. He studied at Copenhagen and Leyden where he became professor in 1620. He deserves the gratitude of historians for publishing a number of works by well-known anatomists. He was himself an anatomist of merit, and was the first to describe the arachnoid membrane accurately. In 1616 he gave a fairly accurate description of the *medulla spinalis.* The influence of VESALIUS is again manifested in the muscleman taken from the *Fabrica.*

Fig. 119.

Ysbrand van Diemerbroek Montfoort, 1609—1674.

Diemerbroek was professor at Utrecht He wrote a large work *Anatome corporis humani*, Utrecht 1672, which was translated into several languages, English among them. It contains many original remarks on the subject of morbid anatomy. In the background of our portrait, engraved by Romein de Hooghe, the tower of Utrecht is seen. It was a custom of the XVIIth century engravers thus to indicate the home of their patrons. Symbolical figures, relating to anatomy encircle the portrait.

Fig. 120.

RAYMOND VIEUSSENS, 1641 to 1717.
VIEUSSENS was physician to the St. Eloy Hospital at Montpellier. Later he became physician to Princess MONTPENSIER at Paris. He had the opportunity of examining more than 500 corpses and is famous for his accurate researches on the heart and nervous system. In dissecting the sympathetic nerve in the neck he found that a loop from the inferior ganglion runs round the subclavian artery. This is now called the *ansa Vieussenii*. The white substance of the brain on the two sides of the corpus callosum bears the name of *centrum semiovale Vieussenii*. The *valve of Vieussens* is also called after him.

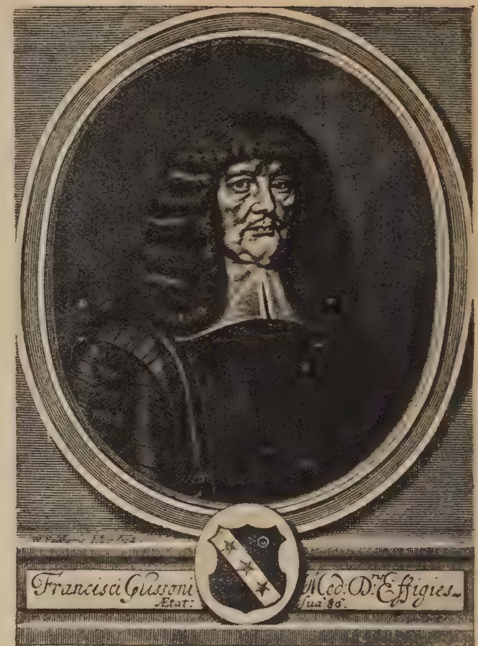


Fig. 122.

FRANCIS GLISSON, (1597—1677) professor at Cambridge who later practiced in London. He was the first to give an accurate description of the liver and described the so-called *Glisson's capsule*. This structure had been known however to PECQUET, WALAEUS also had spoken of it in his letter to BARTHOLIN, *De motu chylis et sanguinis*.

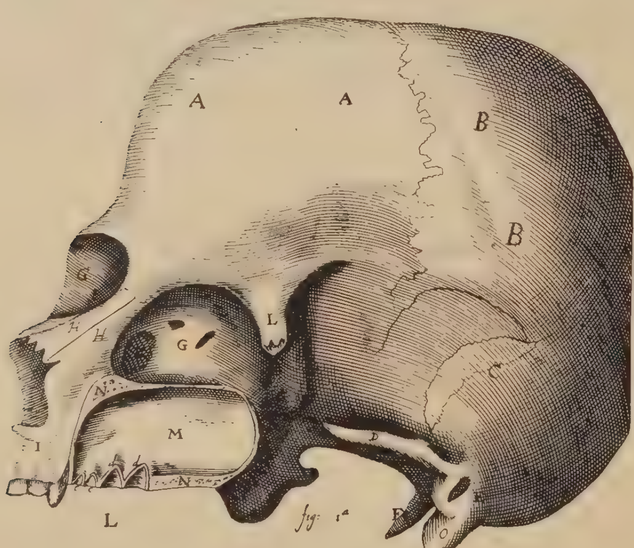


Fig. 123.

From NATHANIEL HIGHMORE, *Corporis humani disquisitio anatomica*, The Hague, 1651.
HIGHMORE (1613—1648) practiced at Shaftesbury. He discovered the cavity in the upper jaw which is called after him and is exhibited in the figure at M. The thickening of the *tunica albuginea* at the hilus of the testis hears the name *Corpus Highmori*.

Fig. 124.

From THOMAS WHARTON, *Adenographia seu glandularum totius corporis descriptio*, Amsterdam, 1659, (the first edition is London, 1656.)
WHARTON (1610—1673) practiced in London. He examined and described the structure and the functions of the submaxillary glands, the duct of which is still called after him and is shown in our figure. The mesodermal core of the umbilical cord forms a fibromucoid tissue known as *Wharton's jelly*.

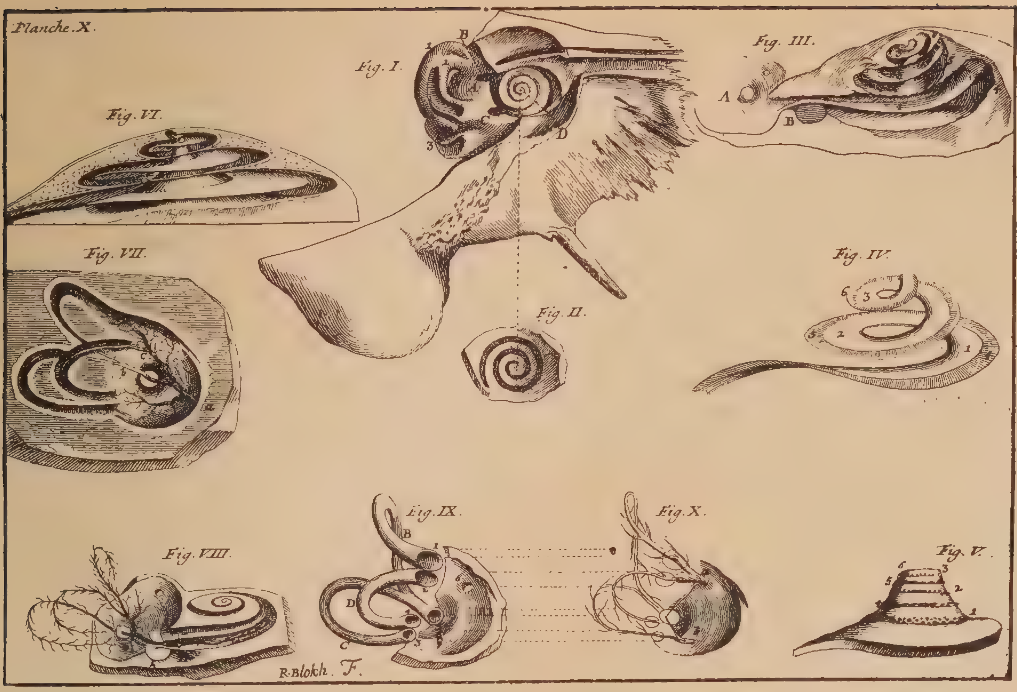


Fig. 121.

From Guichard du Verney (Duverney) *Tractatus de organo auditus*, Leyden 1730.
Du Verney (1648—1730) was founder of the XVIIIth century French anatomical school, and is remarkable for his extremely detailed accuracy. He examined the brain and the circulation of the foetus. His best-known work is on the auditory organs. Our figures give an idea of the careful execution of his work. Figs IX and X show the semicircular canals and the course of the nerves in them, and their relation to the vestibule.

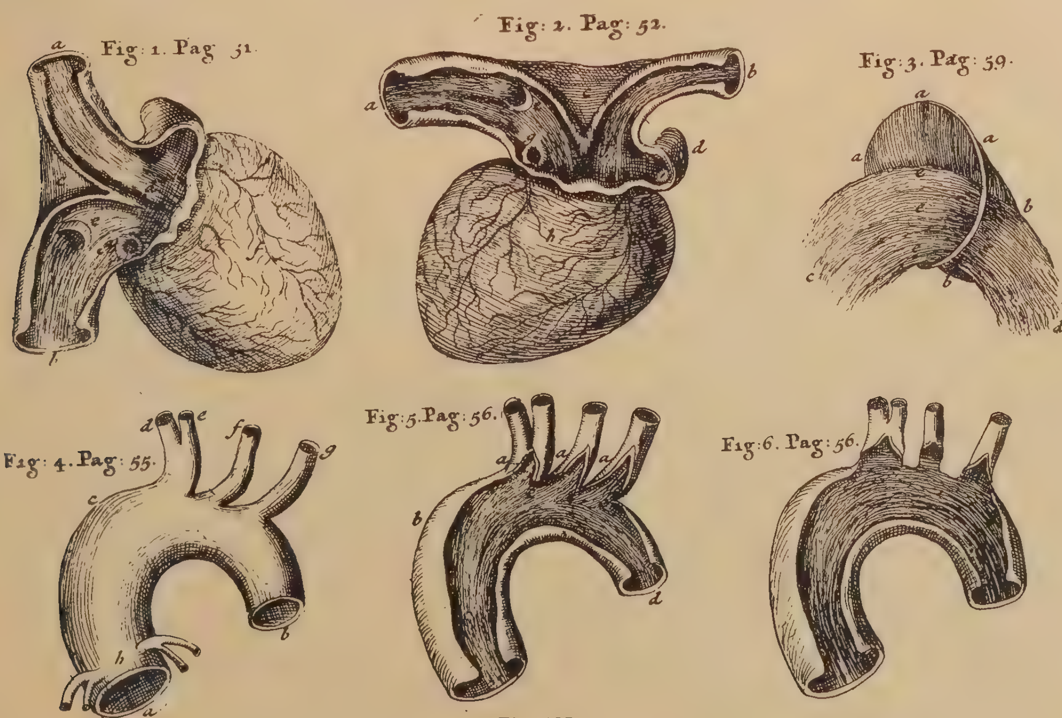


Fig. 125.

From Richard Lower, *De corde*, Leyden 1708.
Lower (1631—1691) practised in Oxford and later in London. He became known by his work on the anatomy of the heart. Our print exhibits a number of representations of the relations of the *venae cavae* and primary branches of the aorta. Fig. 1 and 2 show at *c* the part that Lower describes as *tuberculum ultramque venam distinguens* where both venae cavae begin in the heart. It is now known as the *tubercle of Lower*.

Fig. 127.

Titlepage of JAMES KEILL, *Anatomia.*
KEILL (1673—1719) gave anatomical demonstrations at Oxford and Cambridge. He sought to associate Newton's doctrine of gravitation with the motion of the blood and the physiology of nutrition. Our print shows us a late XVIIth century dissection. Skeletons surround the hall. The dissector is at work upon the head. We see that the observations are still being compared with the printed word. In the background is a group of students with books in their hands studying a muscleman.

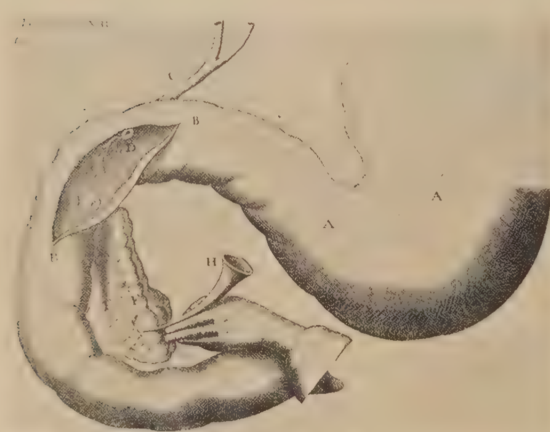


Fig. 130.

From JOHAN CONRAD BRUNNER, *Experimenta nova circa Pancreas,* Amsterdam, 1683.
BRUNNER (1653—1727), was Professor at Heidelberg. He proved by removing the pancreas from dogs that this organ had no part in the elaboration of the blood, as was then generally thought. The figure shows the termination of the common bile duct at D and of the ductus pancreaticus at E. BRUNNER calls this latter orifice the *osculum ductus pancreatici.* The little glands in the duodenum are still called the *glands of Brunner.*

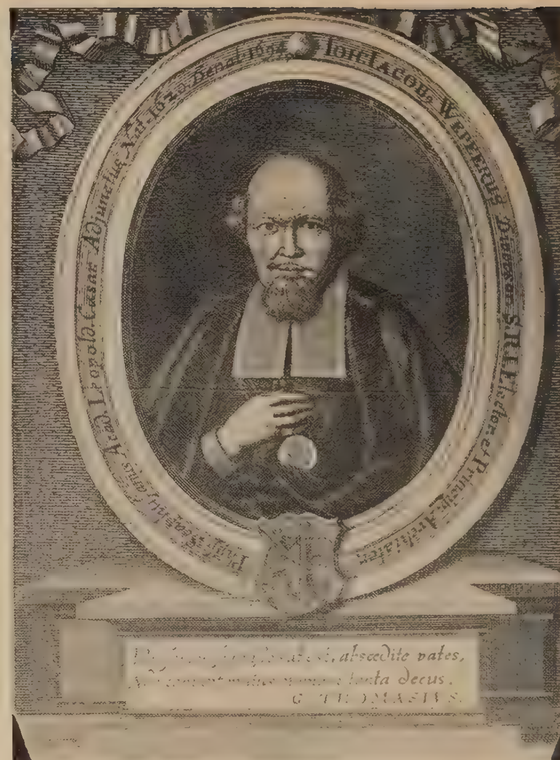


Fig. 129.

JOHANN JAKOB WEPFER, (1620—1695).
WEPFER practised at Schafhausen, and was the first to describe accurately the entire course of the carotids and especially the branches of those vessels in the brain. The work in which these appear is his *Observationes anatomicae ex cadaveribus,* Schafhausen, 1658.

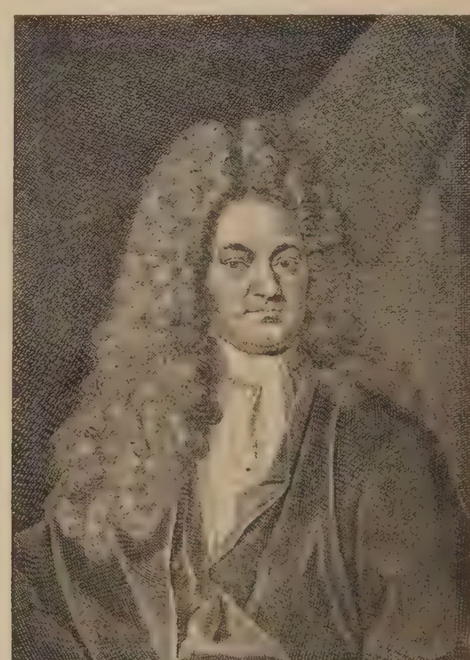


Fig. 131.

AUGUSTUS QUIRINUS RIVINUS (1652—1723), professor at Leipzig. He examined the glands of the intestines, the mouth and pharynx. In 1679 he discovered the small ducts of the lingual glands still called after him. Later this discovery was claimed by CASPAR BARTHOLIN. A natural hiatus which is sometimes found in the *pars flaccida* of the *membrana tympani* is sometimes called the *foramen Rivini.*

Fig. 128.

From William Cowper, *Glandularum quarundam . . . . nuper detectarum ductuumque earum excretionum descriptio*, London 1702.
Cowper, (1666—1709), practised surgery in London, and contributed largely to anatomical knowledge. The representation depicts the urinary and genital apparatus. At S are glands described as *glandula mucosa supra descripta dextri lateris acu distracta*. These are the *Cowper's glands* of modern anatomical nomenclature. In certain of his works Cowper used the plates of Bidloo (Fig. 114).

Fig. 132.

The anatomical theatre at Altdorf as represented by Moritz Hofmann (1621—1698). This theatre was founded about 1650, and was similar in arrangement to that at Leyden (Fig. 72). The spectators sit on one side only and are at some distance from the subject. Human and animal skeletons are ranged round the walls. The picture is curious in that the dissection is being conducted at night, by the scanty light of six wax candles. In 1641 Hofmann discovered the duct of the pancreas in a turkey. George Wirsung of Beieren discovered shortly afterwards the pancreatic duct in the human body, and it has since been called after him.

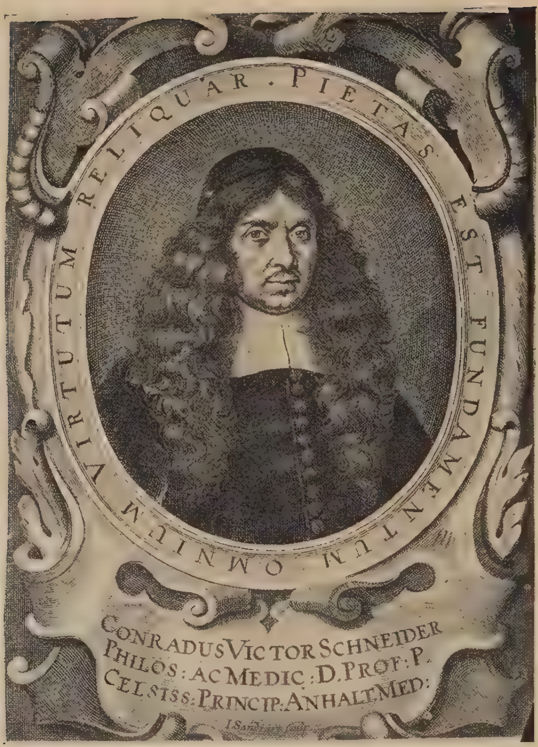


Fig. 133.

Konrad Victor Schneider, 1614 to 1680. In his detailed work *De catarrhis*, Wittenberg, 1600—1664, he described the physiological significance of the lymph vessels, ascribing an absorptive property to them. He considered that their function was to reabsorb such fluid as was withdrawn from the blood as being superfluous for the needs of the tissues.

Fig. 134.

Title page of Johan Conrad Peyer, *Parerga anatomica*, Amsterdam 1682. (First edition, Geneva 1681).

Peyer (1653—1712) practised at Schafhausen and was later professor at Heidelberg. The symbolic picture, represents a dissection of the human body along with that of an animal, and is intended to suggest the comparative method advocated by the writer. Peyer was specially interested in the glands of the intestines. The patches of intestinal lymphatic follicles are called after him.

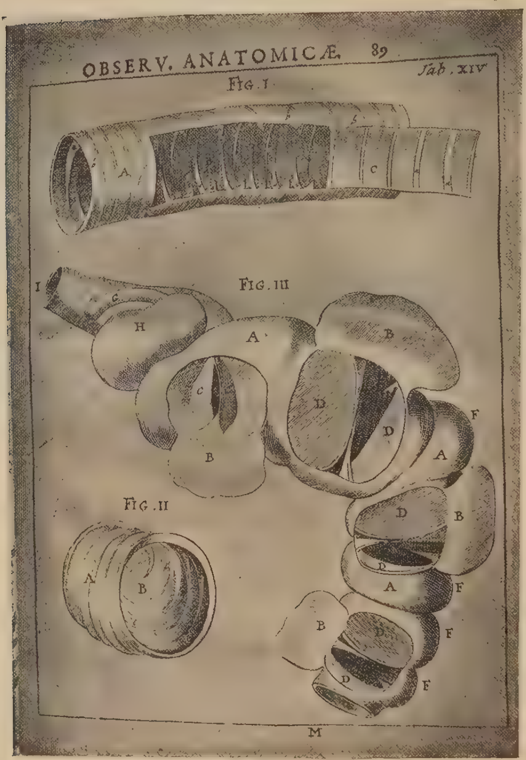


Fig. 135.

Theodor Kerckring, *Spicilegium Anatomicum*, Amsterdam, 1670.

Kerckring, of Hamburg, (1640—1693) was a pupil of Sylvius. He first practised in Amsterdam and later became physician to the Grand Duke of Tuscany in Hamburg. He was the first to discover the *vasa vasorum*. These he found in the portal vein of a horse. He also made observations in Osteogenesis, following from month to month the development of the skeleton. Our figure shows the lumen of the intestine with the projecting folds of the mucous membrane named by him *Valvulae conniventus*.

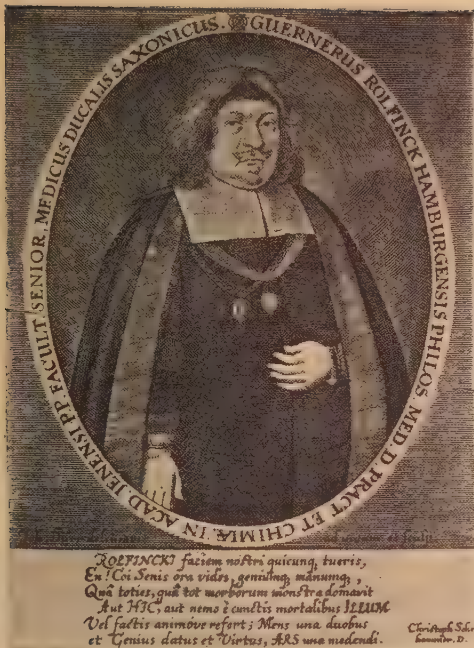


Fig. 136.

Werner Rolvink, (1599—1673), professor of anatomy at Wittenberg. He founded an anatomical theatre at Jena in the middle of the XVII[th] century. Rolvink was so successful in stimulating anatomical interest that he was summoned to the Court at Weimar to give exhibitions of dissection. These formed a part of the court festivities. He was accused of body-snatching, and the fear of this was so great that the peasants set guards over their dead to preserve them from being *rolfinked*, as they called it.

Fig. 137.

Heinrich Meibom, (1678—1740) was born at Lübeck and studied at Groningen and Leyden. In 1664 he became professor at Helmstädt. In his book *De vasis palpebrarum novis*, Helmstädt 1668, he describes the little glands in the eyelids that are called after him. These small glands had, however, already been described, though inaccurately, by Casserio.

Fig. 138.

Nicolaus Stensen (Steno) of Copenhagen, (1638—1686), professor of anatomy at Copenhagen and pupil of Thomas Bartholin. He described for the first time the duct of the parotid gland called after him. He is also known for his work on the lachrymal apparatus and on the finer structure of the brain.

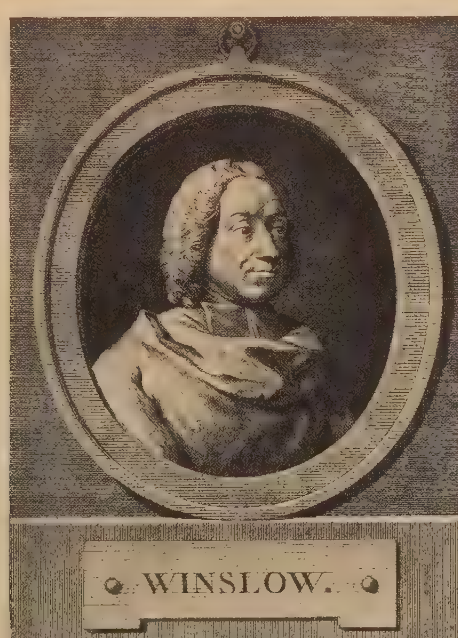


Fig. 139.

Jacob Benignus Winslow (1669—1760) was born at Odensee in the Danish Island Fühn, and became professor in Paris, where in 1745 he opened the new anatomical theatre, built under his direction. He published a book on topographical anatomy which has been translated into most European languages. The foramen between the greater and lesser sacs of the peritoneum is called after him. He exercised a deep influence on anatomical nomenclature.

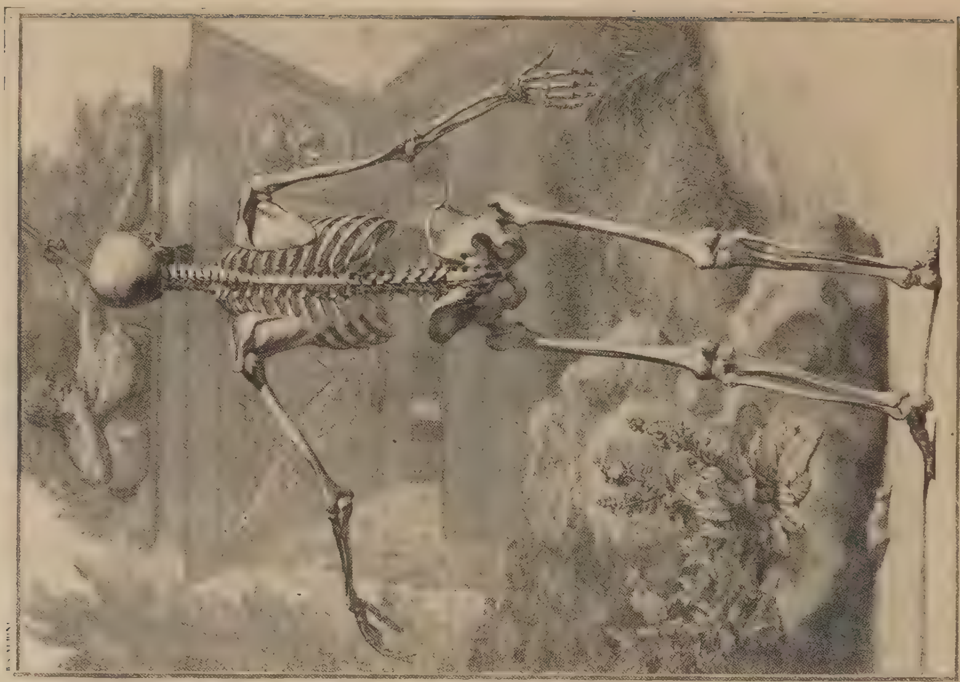


Fig. 140.

Male skeleton from B. S. ALBINUS *Tabulae sceleti et musculorum corporis humani*, Leyden 1747. ALBINUS, or WEISS, (1697—1770), was a pupil of BOERHAAVE at Leyden and of WINSLOW at Paris. In 1718 he became lecturer in anatomy at Leyden and in 1721 rose to be professor. His anatomical atlas is by far the finest published in the XVIIIth century. To get the exact proportions numerous anatomical drawings were made from actual bodies and were carefully averaged to get the final result. Very curious and interesting are the accessories of his figures which were engraved by JAN WANDELAAR. These also are chosen to give an idea of the proportions of the parts. They are thus in contrast to certain other figures, for instance those by ESTIENNE (Figs. 47 and 48), where the accessories are quite unrelated to the subject in hand.

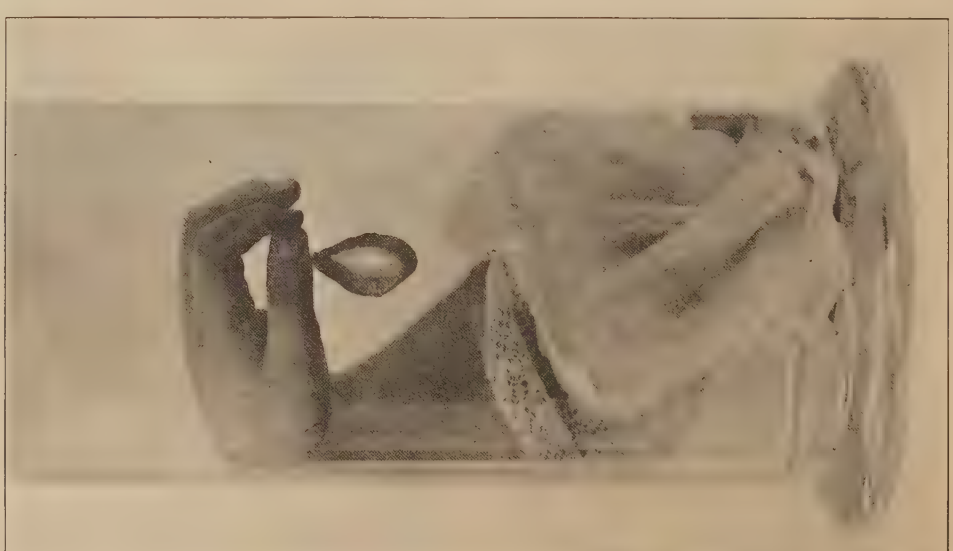


Fig. 141.

Photograph of a specimen in a large collection of anatomical preparations made by B. S. ALBINUS, still preserved at Leyden. It is described as *the arm of a new-born child amputated during life.* In the child's hand is a second preparation described as *the choroid of an adult's eye, with uvea and ciliary ligaments injected through the arteries.* It is a good example of what has been euphemistically called the „elegant" manner of making preparation. The amputated arm is is gracefully veiled in a lace sleeve!

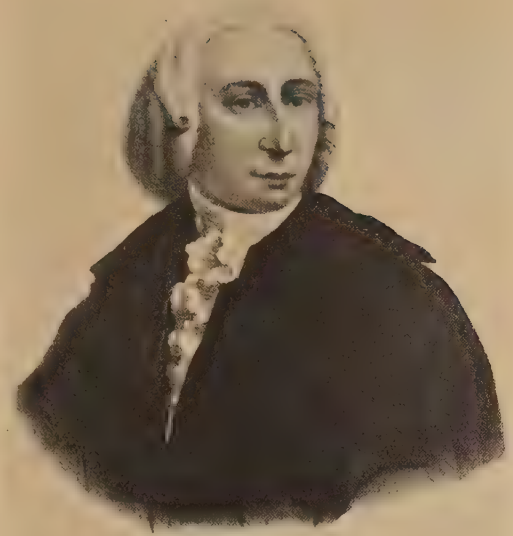


Fig. 142.

Frederik Winter, (1712—1760), professor of medicine at Leyden from 1747. Winter made accurate examinations of the structure of muscle, and found that every bundle can be resolved into fibres which in their turn consist of smaller fibres, all surrounded by a natural sheath. He seconded Haller in the enunciation of the doctrine of irritability.

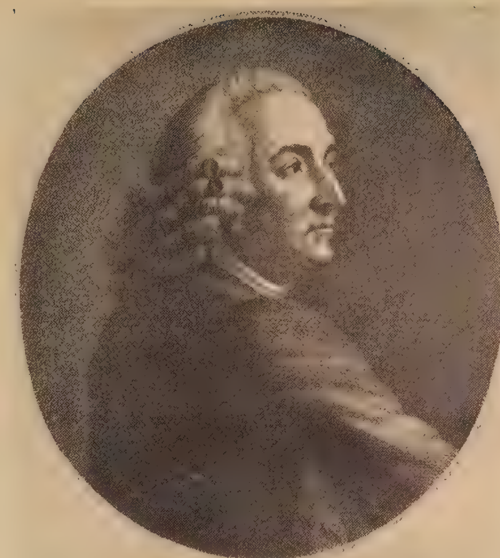


Fig. 143.

Pieter Camper, (1722—1789), professor at Amsterdam and Groningen. He applied himself especially to comparative anatomy and did much work on the finer structure of the eye. In 1767 Camper discovered two cartilages in the membrane, that stretches from the epiglottis to the arytenoid cartilages. These were later given the name of *Corpuscula Wrisbergiana*. A fascia still bears the name of Camper.

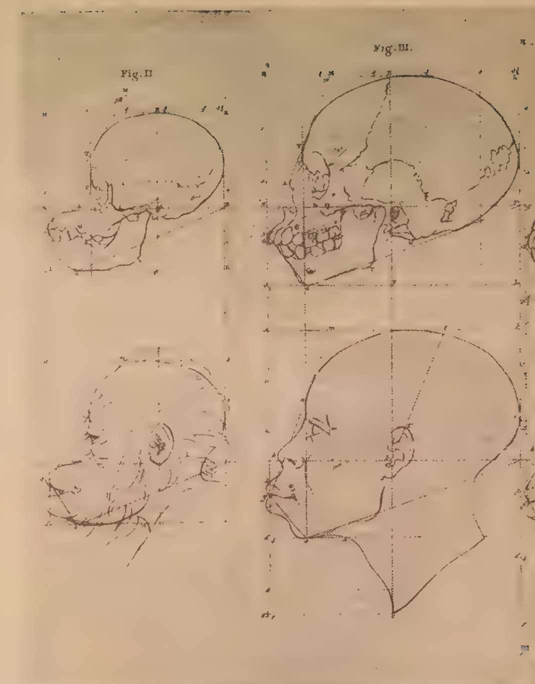


Fig. 144.

From Camper's *Natuurlijk verschil der wezenstrekken in menschen van onderscheiden landaard en ouderdom* — published by his son in 1791. For the comparison of various skulls he introduced the *facial angle* which he regarded as a measure of intelligence. The representations show the optic angle in a chimpanzee and negro.

Fig. 145.

From Eduard Sandifort, *Opuscula anatomica*, Leyden 1784.

Sandifort (1740—1819) was successor to Albinus as professor of Anatomy at Leyden. In 1782 he published the works of Vesalius augmented with a commentary. He was active in morbid anatomy. In 1784 he described a muscle of occasional occurrence, under the trapezius. Sandifort described also the *extensor proprius minimi digitti* in his *Observationes anatomico-pathologicae*. According to him there was no good representation of the duodenum because this was either only examined in the bodies of children or after it had departed from its natural position by the dilatation of the stomach. He therefore gave different representations of the duodenum from different points of view, one of which is here represented.

From Andreas Bonn, *Tabulae ossium morbosorum*, Amsterdam 1788. Bonn (1738—1818), was Professor at Amsterdam from 1771. He wrote a treatise in which he accurately described the skin and the mucous membrane and proved that the cutaneous pores were not, as Ruysch had thought, openings of bloodvessels. He distinguished the synovial and the serous membranes. Morbid anatomy, founded by Morgagni, (Fig 157) and carried on further along his lines by Giovanni Battista Monteggia of Loveno (1762—1805). Lancisi (Fig. 154), Albertini of Bologna, Senac (Fig. 148), and Lieutaud (Fig. 150), was practised with much success in Holland by Sandifort (Fig 145) and Bonn. His pathological researches were especially directed to disease and injuries of bone. Our representation shows two aged skulls, the right maxilla in the upper and the left malar in the lower are broken.

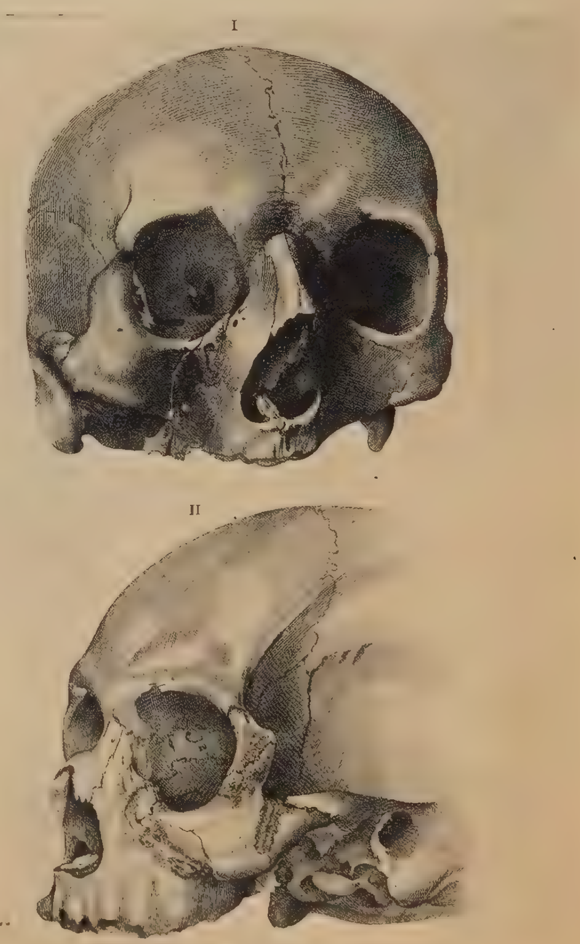


Fig. 146.

Fig. 147.

Johan Jacob Rau (1658—1719) began life as a barber, and was later a ship surgeon. Then he set up as a lithotomist at Leyden, and finally succeeded Bidloo in 1713 as professor of anatomy there. Ruysch had shown that the choroid tunic of the eye consisted of two layers. Rau insisted that Ruysch by his injections had changed the natural condition, and that in the human being these two layers cannot be separated. Rau also improved the description of the small bones of the ear.

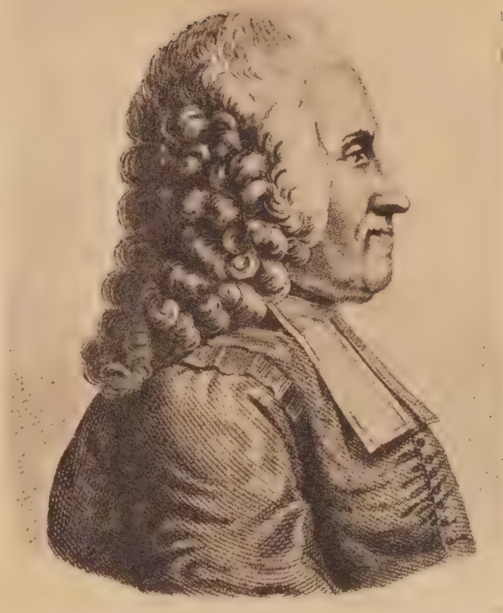


Fig. 148.

Jean Baptiste Senac (1693—1770) was born at Lombez in Gascony. He wrote a valuable work on the heart, which was first published anonymously. In 1774 a new edition was issued by his collaborator, Portal. It is based on an accurate examination of the organ. It may be said to have laid the foundation of cardiac pathology, based on the normal anatomy and physiology.

Fig. 149.

From Senac's *Traité de la structure du coeur, de son action et de ses maladies*, Paris. 1749. The legend of this figure runs as follows: „L'intérieur du ventricule gauche, pour cela on a fait une section, par l'aorte et on l'a poussée le long de la cloison. Il n' y a que cette section qui puisse montrer la grande valvule et laisser les piliers dans leur entier."

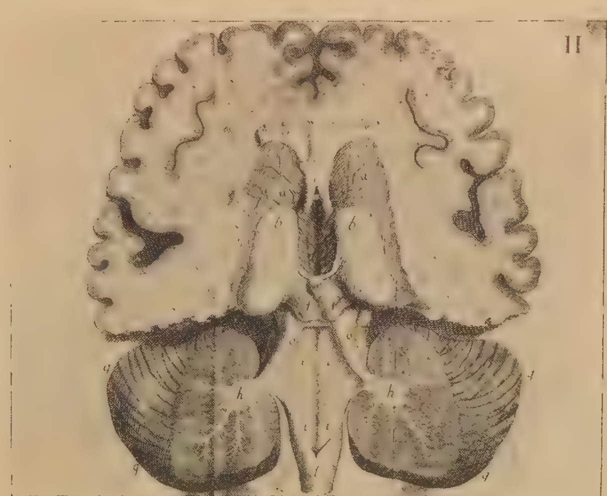


Fig. 150.

From Josephus Lieutaud,: *Essais anatomiques, contenant l'histoire exacte de toutes les parties qui composent le corps de l'homme*, Paris 1742. Lieutaud (1703—1780) was successor to Senac as court physician to Louis XV. He performed about 1200 dissections at Versailles and used these as a basis for his anatomical work. He took much from Bonnet and Morgagni. Lieutaud studied the urinary bladder, and especially the mucous membrane in the region of the trigone. Nicolas Massa (Fig. 36) had noticed a swelling between the neck of the bladder and the end of the ureters.
Our figure shows a section of the brain, which carries the legend: „Les couches des nerfs optiques séparées et écartées laissent voir le trousième ventricule et par la section verticale du cervelet ou découvre l'arbre de vie et le quatrième ventricule."

Fig. 151.

From David Cornelis de Courcelles, *Icones musculorum capitis*, Leyden 1743. De Courcelles was born early in the XVIIIth century. He was a pupil of Albinus and is known for his researches on the muscles of the sole of the foot and of the head. As with Albinus, his drawings are distinguished for their clearness. The parotid and submaxillary glands are as clearly and accurately set forth as the various facial muscles.

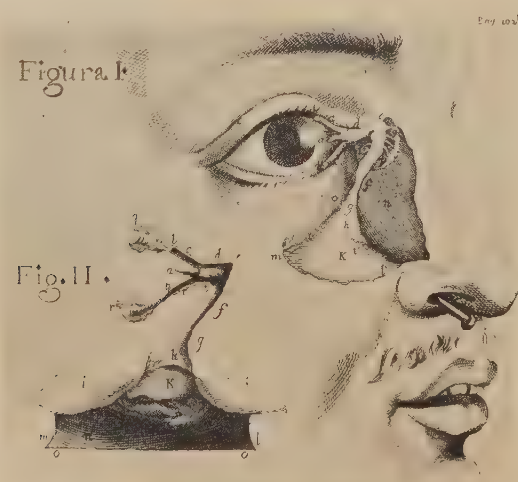


Fig. 153.

From Giovanni Battista Bianchi *Ductus lachrymales nervique eorum anatome usus morbi et curationes*, Turin 1715.
Bianchi (1681—1761) was professor at Bologna. He made many exact anatomical researches of which the best-known is that on the liver which involved him in controversy with Morgagni. A better work, however, is that on the lachrymal organ which is here illustrated.

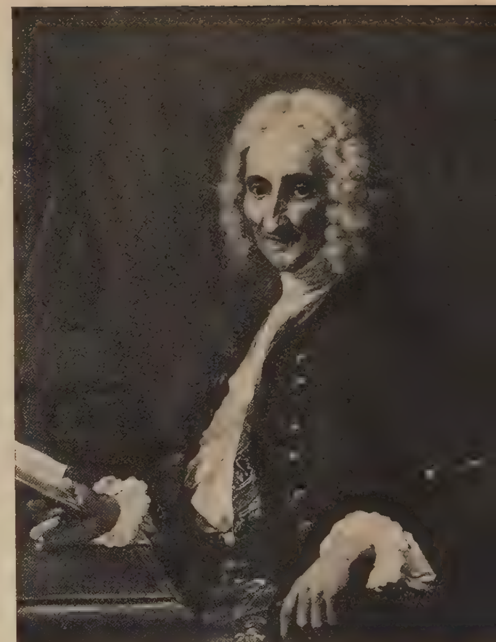


Fig. 152.

François Pourfour du Petit, (1664—1741) wh practised at Paris and became known especially fo his studies of the lens of the eye. The circular sac culated lymph space around the equator of the len is named after him. The small triangle bounded b the iliac crest, the *latissimus dorsi* and the *obliqu externus abdominis* is also called after him.

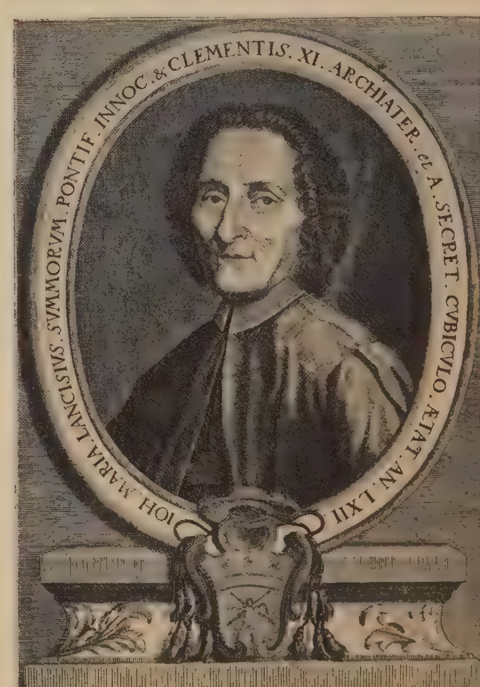


Fig. 154.

Giovanni Maria Lancisi of Rome (1654—172 court physician to the Popes Innocent XI and X and Clement XI and protomedicus of the Papal State Lancisi is known for his account of the *corpus callosu* and of the *epiphysis cerebri* or pineal gland.

Fig. 155.

Antonio Maria Valsalva, (1666—1723), profesor of anatomy at Bologna. His work *De aure humana tractatus*, Bologna 1704, gives a very fine description of the anatomy of the ear.

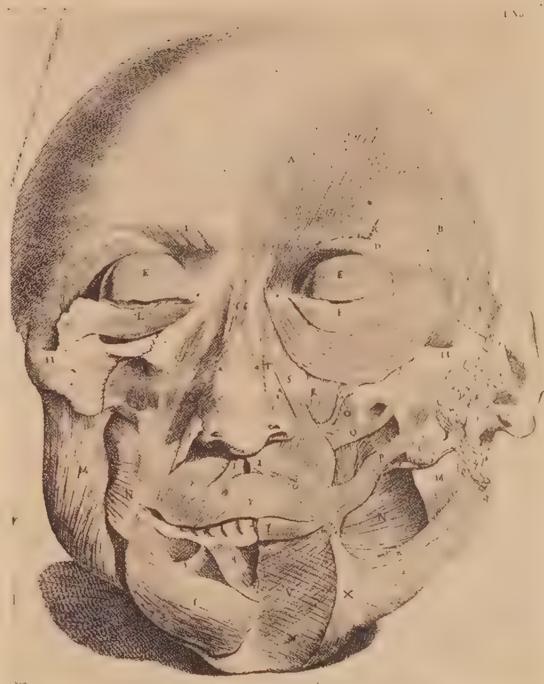


Fig. 156.

Giovanni Domenico Santorini. From the *Observationes anatomicae*.

Santorini (1681—1737) was a pupil of Bellini and himself practiced at Venice. He was known for the fineness of his preparations. He described the *musculus risorius*. The aryteno-epiglottidean folds exhibit at their posterior ends the *tubercles of Santorini*.

Giovanni Battista Morgagni, (1682—1771) was a pupil of Valsalva from 1712 till his death. He was professor of anatomy at Padua. He founded modern morbid anatomy by his work *De sedibus et causis morborum per anatomen indagatis*, Venice 1761. Bonet (fig. 110) had in his *Sepulchretum*, Venice 1679, produced an important work on morbid anatomy. In it, however, besides various monstrosities, he had described numbers of normal cases as pathological· Morgagni avoided this error by attempting to bring the symptoms of the diseases observed during life into relation with the phenomena which dissection revealed. Several parts of the body have been called after this great anatomist, among them the valves in the anal canal.

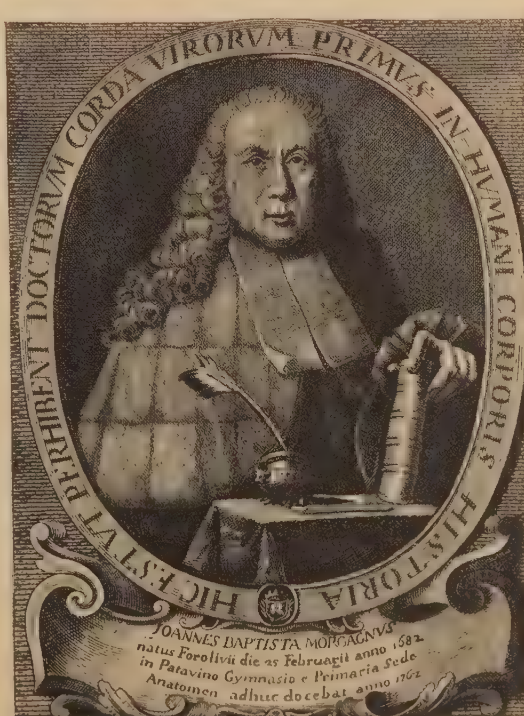


Fig. 157

Fig. 158.

Leopold Marcantonio Caldani, (1725—1813), a pupil of Morgagni, after the death of whom he became professor of anatomy at Padua. Caldani made it his aim to collect all the best anatomical representations that had appeared up to his time. These he published in 1801 in his *Icones anatomicae*, produced in collaboration with his cousin, Floriano Caldani.

Fig. 159.

From Domenico Cotugno, *De Aquaductibus auris humana internae, Dissertationes anatomicae,* Naples 1760. Cotugn (1736—1822) was a pupil of Morgagni and from 176 till his death professor of anatomy at Naples. He re examined the auditory organs, especially the labyrinth in which he discovered the fluid. He described also th naso-palatine nerve, which was afterwards named afte Scarpa.

Fig. 160.

William Cheselden, (1688—1752), an influential London anatomist and pupil of Cowper. He applied himself especially to osteology. In his *Osteographia or anatomy of the bones,* London, 1703, all the bones are reprensented of their natural size.

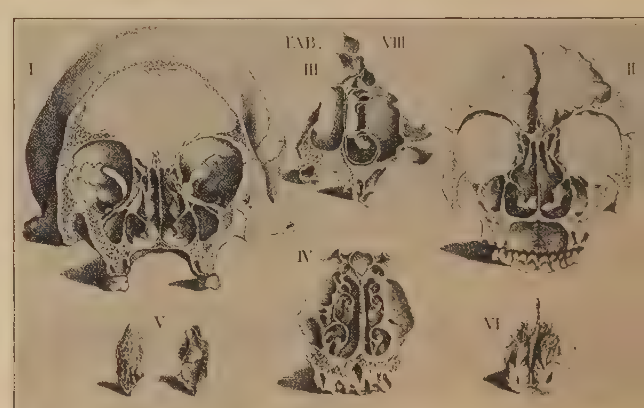


Fig. 161.

From James Douglas, *Osteographia veteris ac novae specime or an Essay towards a new description of the human bone* London 1725. Douglas (1675—1742) practised in Londo and was royal physician Very meritorious is his descriptio of the peritoneum. The *pouch of Douglas* is named afte him. In his *Osteographia* he represented all the bones c their natural size. The volume also contains many figure of sections. Those of the skull bones are shown in thi figure.

Fig. 162.

From ALEXANDER MONRO, *A description of all the bursae mucosae of the human body*, Edinburgh 1785.

MONRO (SECUNDUS 1732—1817) was the son of another ALEXANDER MONRO. This MONRO PRIMUS, (1697—1767) was a pupil of BOERHAAVE, practiced in Londen, and later founded the medical school of Edinburgh. He was known for his work on the bones and nerves of the human body. The son was professor at Edinburgh, and was the first to describe the Bursae.

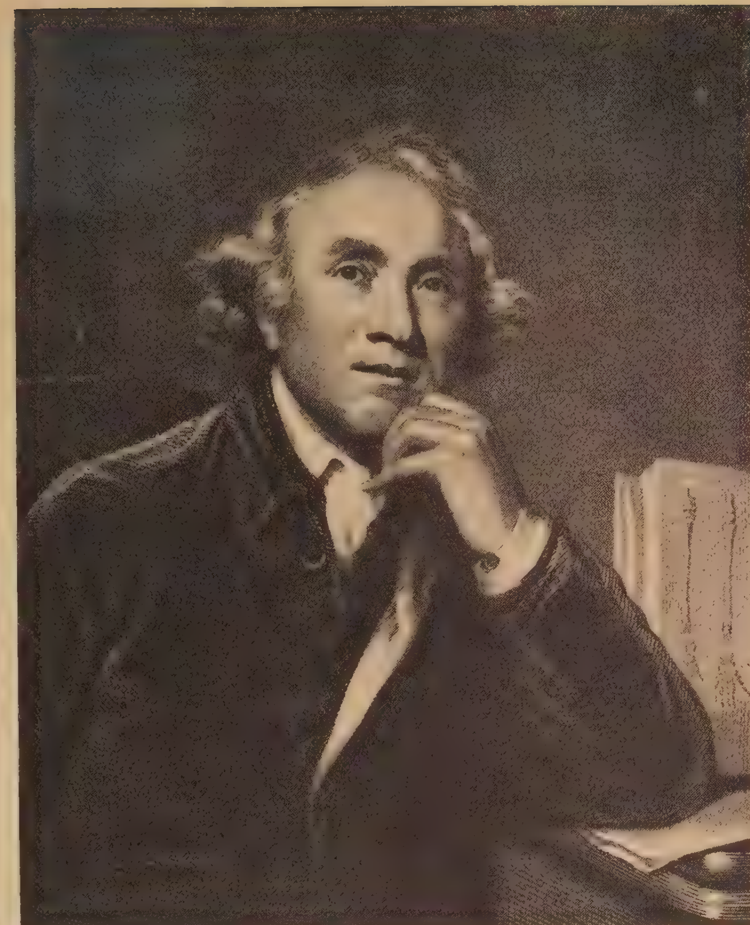


Fig. 163.

JOHN HUNTER (1728—1793) was first assistant to his brother, WILLIAM HUNTER. Afterwards he set up as an independent anatomical teacher. He was one of the greatest surgical investigators that the world has seen, and eminent in every department that he touched. The magnificent collection of specimens which he put together forms the nucleus of the Museum of the Royal College of Surgeons, London.

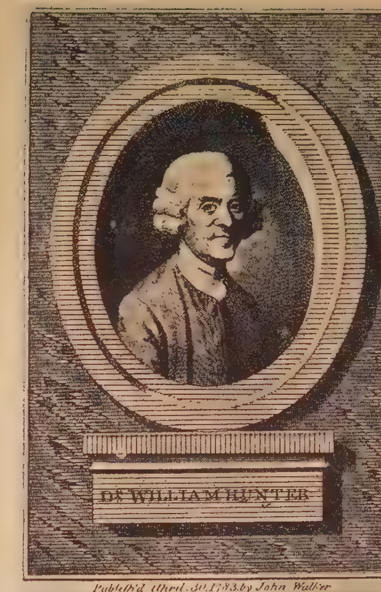


Fig. 164.

Portrait of WILLIAM HUNTER (1718—1783), brother of JOHN HUNTER and surgeon-accoucheur to the Middlesex Hospital, London. In his *Medical Commentaries* he describes the anatomy of the testis and claims for himself the priority in the injection of the vessels of that organ with mercury. In this matter the priority, however, belongs to Haller. HUNTER was a man of learning and culture, and many of his books, manuscripts and specimens are now at Glasgow. He is also memorable for his magnificent atlas of the gravid uterus.

Fig. 165.

From William Cruikshank, *The anatomy of the absorbing vessels of the human body*, London 1786. Cruikshank (1760—1800) taught anatomy at Edinburgh. He was a friend and assistant of William Hunter, Anatomically, Cruikshank is remembered for his work on the lymph vessels. Our figure shows the vessels and grands in the inguinal region.

Fig. 166.

Laurentius Heister, (1683—1758) professor of anatomy at Altdorf and afterwards at Helmstadt. He wrote a popular *Compendium anatomicum* that was translated into French, German and English, and has been repeatedly reprinted. The book gives a good picture of the state of anatomical knowledge in his day.

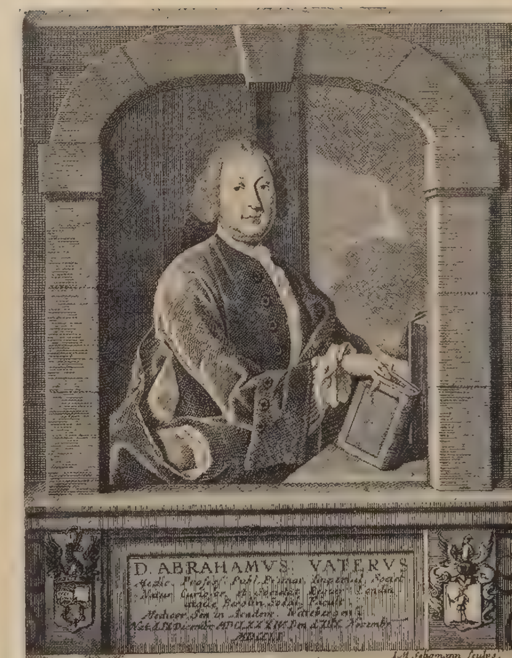


Fig. 167.

Abraham Vater, (1684—1751) was born at Wittenberg and became in 1719 assistant professor and in 1733 professor of anatomy there. He founded an anusually rich anatomical museum. The enlargement of the bile duct just before entering the duodenum is sometimes called the *ampulla of Vater*. The so-called Pacchionian corpuscles discovered by Antonio Pacchioni (1665—1726), were re-described by Vater.

Fig. 169.

Titlepage of Johan Adam Kulm, *Tabulae Anatomicae*, Amsterdam 1731. Kulm (1680—1745), practised at Dantzig. His *Tabulae* were very popular and have been repeatedly re-printed and translated. They were produced as late 1789, with 27 new representations by Karl Gottlob Kühn. Our figure shows a dead body lying on a dissection table at the side of which pieces are hollowed out. In the foreground is a table of dissecting instruments. The *Tabulae* were even translated into Japanese, after a Japanese physician named Mayeno had satisfied himself by a dissection of a Japanese woman, Aocha-Baba, that they presented the true anatomical relations, and thus demonstrated that such anatomy as had been taught in Japan up to that time was absolutely false.

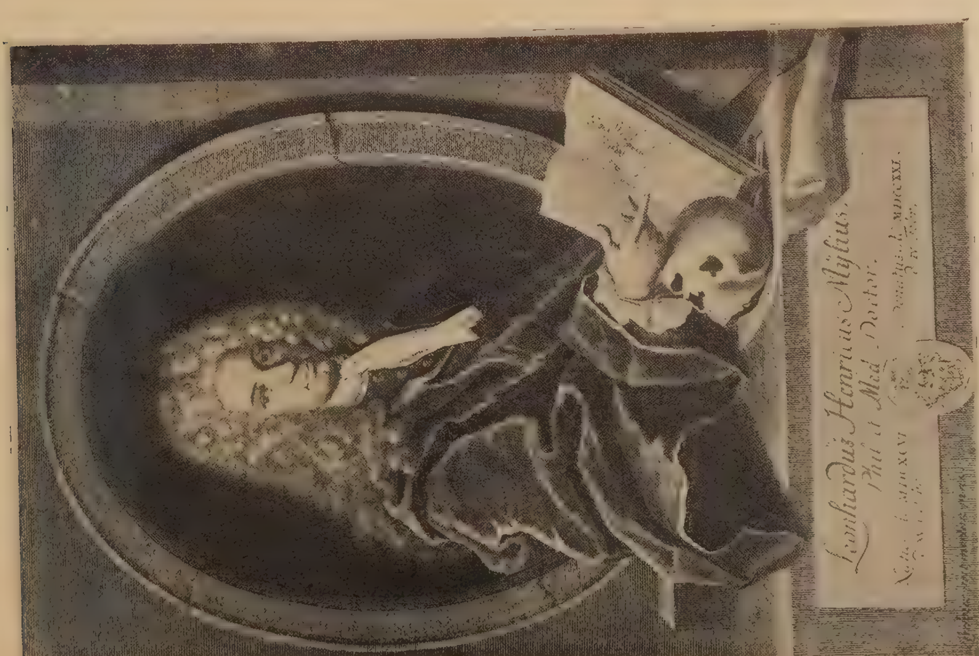


Fig. 168.

Leonard Heinrich Mylius (1696—1721) was teacher oi anatomy at Leipzig and assembled a great collection of anatomical preparations and objects of natural history.

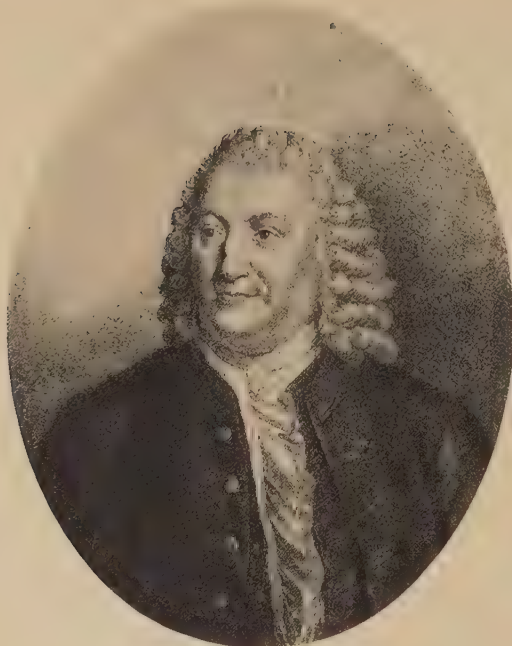


Fig. 170.

Albrecht von Haller (1708—1777), pupil of Boerhaave and Albinus, returned in 1729 from Leyden to his native town Bern. In 1736 he became professor of anatomy in Göttingen. Apart from his important physiological doctrine of irritability, Haller is also renowned as an anatomist. He gave good descriptions of the vascular system and especially of the structure of the heart, the vascular anastomoses and the relation of the nerves to the blood vessels. He also investigated the relations of the urinary bladder at various ages and wrote much on the anatomy of the genital system. His text-book of physiology was current for many years. He was also an authority on the history of medicine.

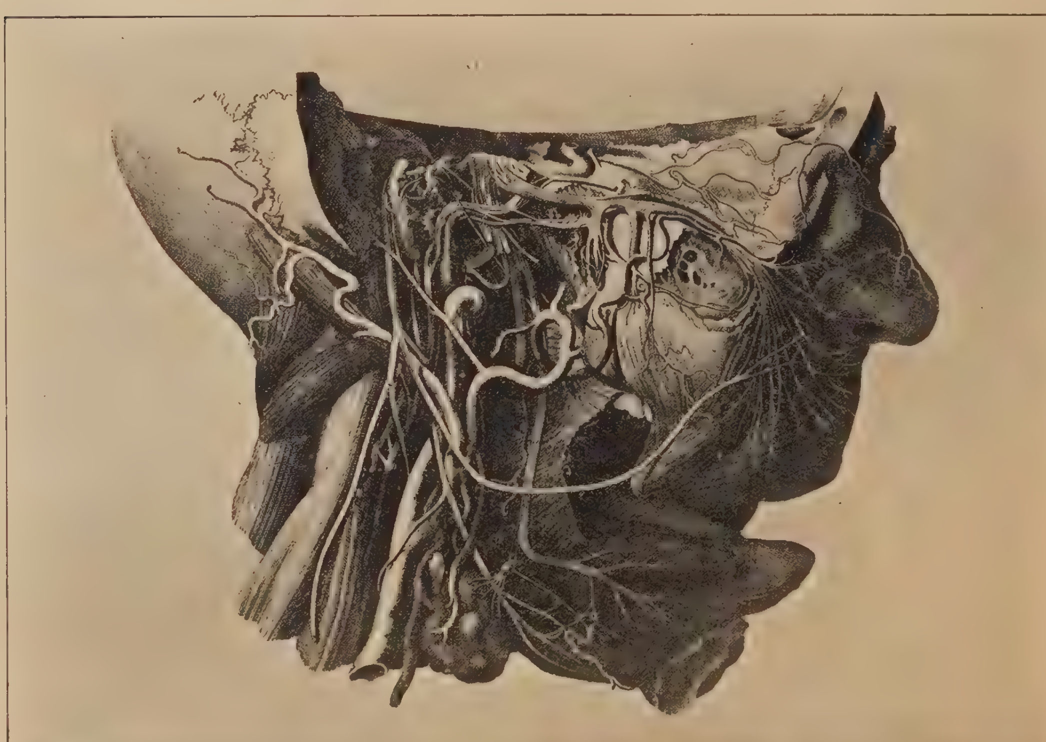


Fig. 171.

From Johann Friedrich Meckel, *Tractatus anatomico-physiologicus de quinto pare nervorum cerebri.* Göttingen, 1747.

Meckel (1724—1774) taught anatomy at the medical college in Berlin, and was afterwards professor in Halle. His figures were much admired by Haller. He has left his name in *Meckel's cartilage* which forms the embryonic basis of the bone of the lower jaw.

Fig. 172.

From Johann Nathaniel Lieberkühn, *Dissertatio de fabrica et actione villorum intestinorum tenuum*, Leyden 1745.

Lieberkühn (1711—1765) studied at Jena and Leyden and afterwards practised in his native town, Berlin. He is especially known for his microscopical researches on the intestines. The so-called *crypts of Lieberkühn* are named after him. In his own day he was known for the beauty of his injection preparations, some of which are still in existence in Berlin. Our figure carries the legend, *Icon exhibet lenticula microscopii superficium villosum.*

Fig. 173.

From Heinrich August Wrisberg, *Observationes anatomicae de structura ovi et secundinarum humanarum in partu maturi et perfecto collectae*, Göttingen 1783.

Wrisberg (1739—1808) was professor of anatomy at Göttingen. He investigated the peritoneum and the ganglia in the abdominal cavity. The figure shows the membranes of a foetus of 4 months, a. a. amnion, c. c. chorion laeve, d. d. chorion fungose. Several structures are still sometimes described under his name.

Fig. 174.

Thomas von Sömmering (1755—1830), the most famous anatomist in Germany in the second half of the XVIIIth century. Following the example of his master Albinus, he endeavoured to make anatomical representations as natural as possible Clearness and accurate imitation of nature characterises all his works, the best of which is perhaps the *De basi encephali et originibus nervorum cranio egredientium*, Göttingen, 1778. We still speak of the *long pudendal nerve of Sömmering*. He investigated the anatomical effects of tight lacing, and was thus instrumental in introducing more rational clothing.

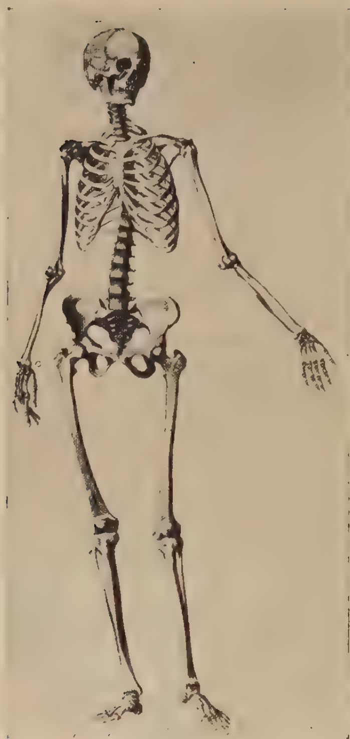


Fig. 175.

This figure of the female skeleton was prepared by Sömmering as a contrast to the male skeleton of Albinus (Fig. 140). Sömmering selected the skeleton of a young girl of 20 years old from Mainz, whose skull served also as one of the types adopted by the anthropologist Blumenbach. Kilian, a well-known accoucheur, had the skeleton copied life-size at a later date, for use in his obstetrical atlas.

Fig. 176.

Antonio Scarpa, (1747—1832), a pupil of Morgagni and from 1783 professor of anatomy at Pavia. His anatomical works deal chiefly with the finer branches of the nerves the structure of bones, and the organs of hearing and of smell. He is remembered in *Scarpa's triangle.*

Paolo Mascagni (1752—1815), professor at Florence from 1811.

The university of Paris for many years offered for public competition a prize for an essay on lymph vessels. Mascagni won this on his second application in 1784. In 1787 Mascagni published his work and yet later a detailed and greatly improved study of the lymph-vessels

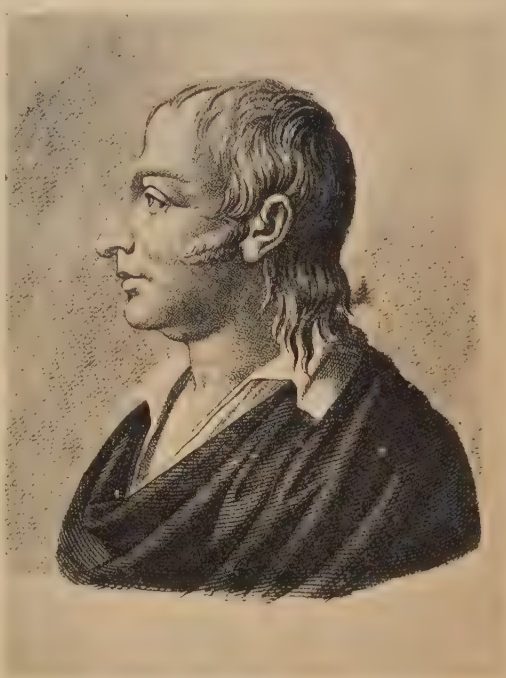


Fig. 177.

Fig. 178.

Marie François Xavier Bichat (1771—1804) of Paris, during his very short life, got through an immense amount of work. During a single winter he examined six hundred corpses and for a while even lived and slept in the dissecting-room. Till his time anatomy was a mere collection of descriptions of the different organs and groups of organs. Bichat, however, called general anatomy into existence. He distinguished the tissues common to all or peculiar to each part of the body. He thus changed the whole anatomical and physiological outlook.

Fig. 178.

Fig. 179.

From Pierre Nicolas Gerdy, *Traité de l'anatomie des formes appliqués aux beaux-arts et à la chirurgie*, Paris 1829.

Perdy (1797—1856) was professor at Paris. The figure shows the various superficial parts of the body in reference to the surface markings. Gerdy is especially known for his researches on the muscles.

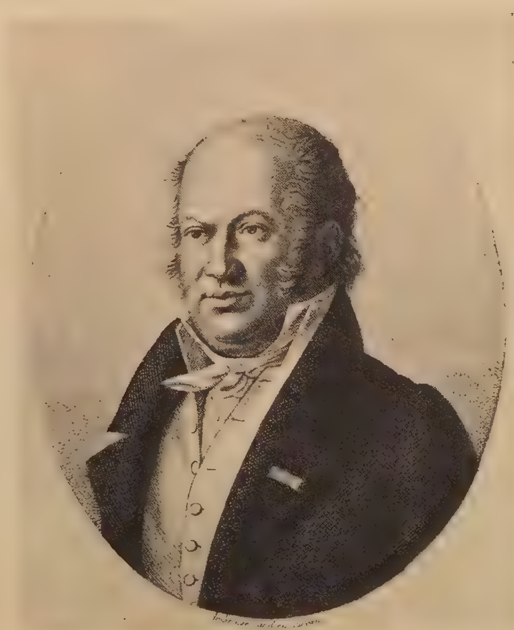


Fig. 180.

Isidore Geoffroy St. Hilaire (1772—1844), professor at Paris, was a man of great distinction and is known in anatomy especially for his investigations of the abnormalities and deformities of the foetus.

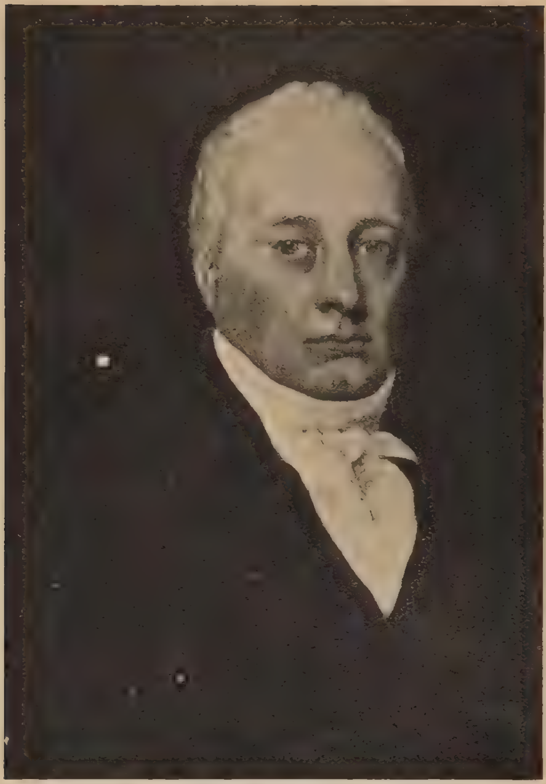


Fig. 181.

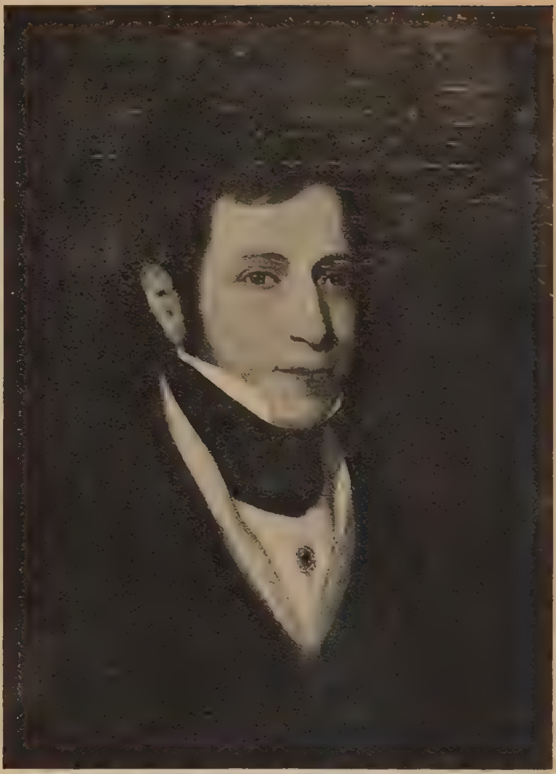


Fig. 182.

JOHN BELL, (1763—1820) and CHARLES BELL (1774—1847). The two brothers, sons of a Scottish clergyman, were the leading anatomists in England in the first half of the XIX[th] century. JOHN was a most accomplished practitioner, teacher and writer. He published a handbook on anatomy, in which the respiratory and circulatory organs are particularly well described. CHARLES is the discoverer of the separate spinal origin of the sensory and motor nerves. He is perhaps best remembered as an artist, and his works *On the anatomy of expression* and *On the hand* are still read.

Fig. 183.

From J. BLEULAND, *Icones anatomico-physiologicae*, Utrecht 1826. BLEULAND (1756 - 1838), was professor of anatomy at Harderwijk from 1791 and at Utrecht from 1795. He made a vast number of anatomical preparations. Our figure, which in the original is produced in natural colours, depicts the oesophagus and neighbouring parts of a newly born infant. The blood vessels and nerves are *in situ*.

Fig. 184.

From WILLEM VROLIK, *Tabulae ad illustrandum embryogenesin hominis et mammalium*, Amsterdam 1849. VROLIK is known especially for his researches in teratology. Our figure shows a sternopagus (transition to the xiphopagus).

Fig. 185.

FRIEDRICH TIEDEMANN (1781—1861), professor at Heidelberg from 1816. The great wealth of post mortem material there gave him opportunities to become one of the first anatomists of his time. He wrote studies on the acardiac foetus and on the development of the brain, and a large work on the arteries. His examination of the brains of various races led him to plead strongly for racial equality.

Fig. 186.

JOHANN FRIEDRICH BLUMENBACH of Gotha (1752—1840), professor at Göttingen. He was specially eminent in the departments of comparative anatomy and anthropology. He was the first to hold formal lectures on comparative anatomy and it was he who directed anthropology into scientific paths. He taught that the various human races must originate from the same stock. He is especially remembered for his work *De generis humani varietate nativa.*

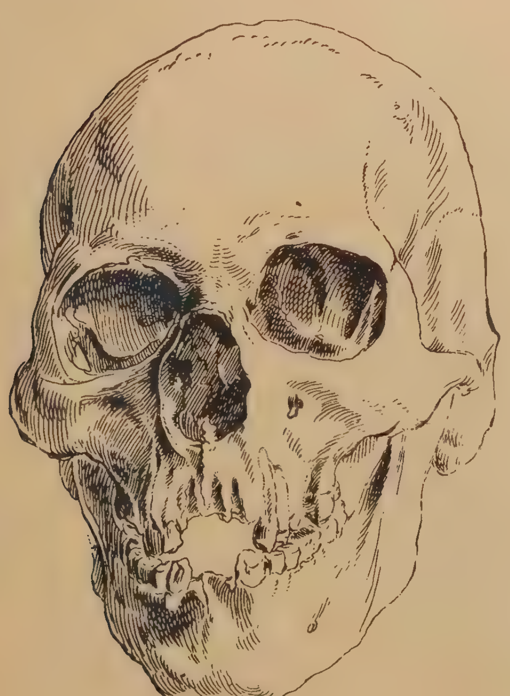


Fig. 187.

Skull of an Egyptian mummy from BLUMENBACH'S *Collectiones craniorum diversarum gentium decades*, 1790—1820. In his examinations of the skull BLUMENBACH emphasized the "general impression" in contrast with the present current methods of measures and weights.

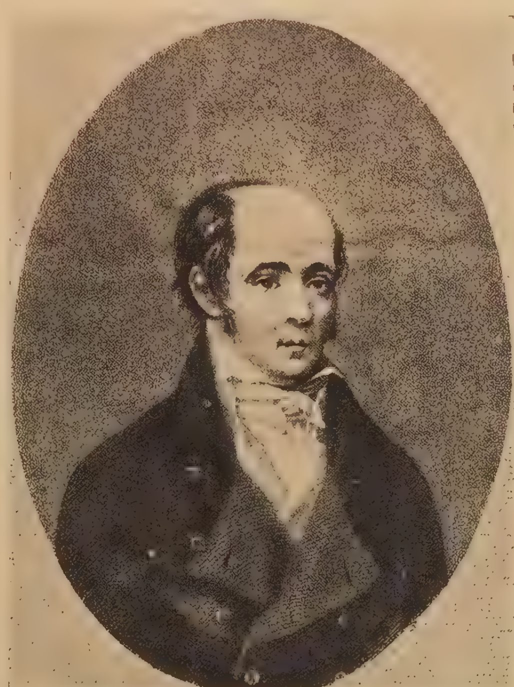


Fig. 188.

FRANZ JOSEPH GALL (1758—1828). He took his degree at Vienna in 1785 and applied himself to anatomy. He assembled a large collection of skulls together with plaster of Paris and wax casts of skulls. He traced the course of the nerve fibres of the white substance from the spinal cord into the brains and endeavoured to find their place of origin. He held that there is a fixed relation between tracts of the brain and areas of the craniûm. Thus he fixed his attention on the external form of the skull and tried from that to draw conclusions as to the individual qualities. In the hand of his successors phrenology has ceased to be a science.

Fig. 189.

From H. Bruyères, *La phrénologie.* Johann Christoph Spurzheim (1776—1832) is here depicted between two groups of people of different social standing. On the left is a selection of degenerates, of the lower class, among them a hydrocephalic supporting his heavy head with his hands. On the right people of the higher class are shown, all bearing the marks of their vices, the usurer and notary who have enriched themselves at the sacrifice of the interests of those who trusted them, the rich woman who shrinks from nothing in seeking pleasure. Spurzheim was a pupil of Gall, afterwards his secretary and assistant. He accompanied Gall on all his journeys through Europe and became famous as a phrenologist.

Fig. 190.

Leopold Christiaan Friedrich Dagobert, Baron Cuvier (1769—1832) is one of the greatest figures in the history of anatomy. New paths were opened up in the subject by his vast comparative studies. His *Leçons d'anatomie comparée*, Paris 1800, and his *Le règne animal, distribué d'après son organisation pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée*, Paris 1817, had great influence on the anatomy of his time.

Fig. 191.

Johannes Müller of Coblenz, (1801—1858), professor at Bonn and Berlin. He was one of the last of the old school who treated anatomy and physiology both human and comparative as a single subject. He was a most inspiring teacher and many schools of thought both in physiology and in comparative anatomy can be traced back to him. The discoveries of Charles Bell (Fig. 176) became generally known through him. By his treatment of the finer structure of the glands, the tissue doctrine of Bichat entered on a new phase. The cell theory, enunciated by pupils of Müller, thus emerged.

Fig. 192.

Johannes Evangeliste Purkinje, *Symbolae ad ovi avium historiam*, Leipzig 1830. Purkinje (1787—1869), professor at Breslau and Prague, discovered in 1825, the germinal vesicle in the eggs of birds. He undertook extensive microscopical researches on the structure of the skin, bones, arteries and veins and described the axis cylinder of nerve-fibres.

Fig. 193.

KARL ERNST VON BAER (1792—1876) professor at Königsberg and Dorpat. Together with CHRISTIAN PANDER (1793—1865) of Petrograd, he opened a new era in the study of embryology. PANDER described the formation of the embryo from the germ layers and in 1827 VON BAER found the human ovum in the Graafian follicle.

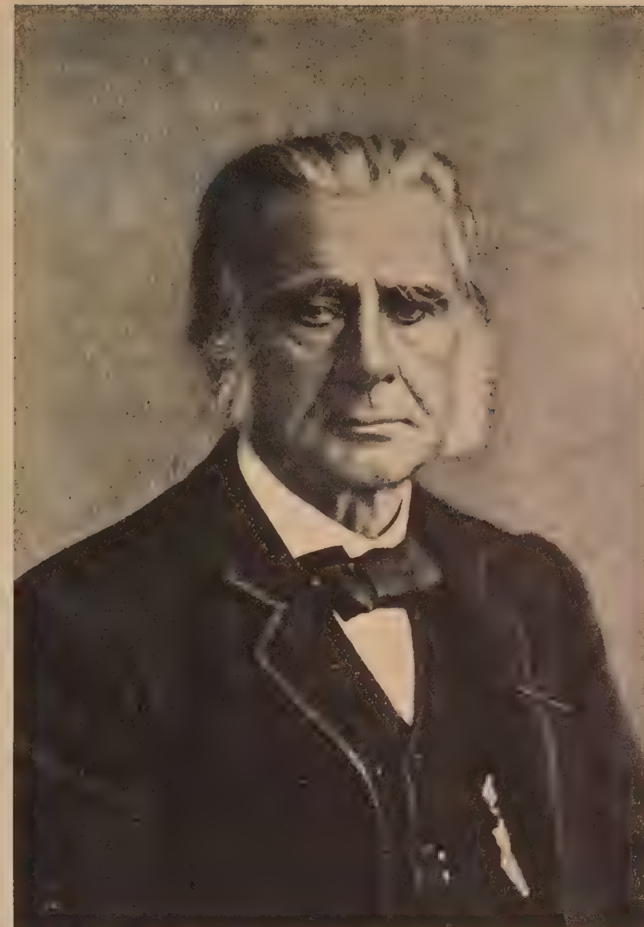


Fig. 194.

THOMAS HENRY HUXLEY (1825—1895) began life as a medical officer in the Navy and later became a teacher of natural history. His most important work was the application of the doctrine of evolution to palaeontology, and he was the main agent in the dissemination of DARWIN's teaching. In 1863 he wrote *On evidence as to man's place in nature.*

Fig. 195.

THEODOR SCHWANN (1810—1882) who in his *Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und den Wachstum für Tiere und Pflanzen*, 1839, taught that the animal body is made up of cells, just as JACOB SCHLEIDEN had done a few years previously for plants.

Fig. 196.

Jean Baptiste P. A. de Monet Chevalier de Lamarck, (1744—1829) was a forerunner of Darwin. In his *Philosophie zoologique*, and the *Système des animaux sans vertèbres*, 1801, he set forth the idea that variations arose though the use or disuse of the organs, and that such use or disuse was conditioned by external influence.

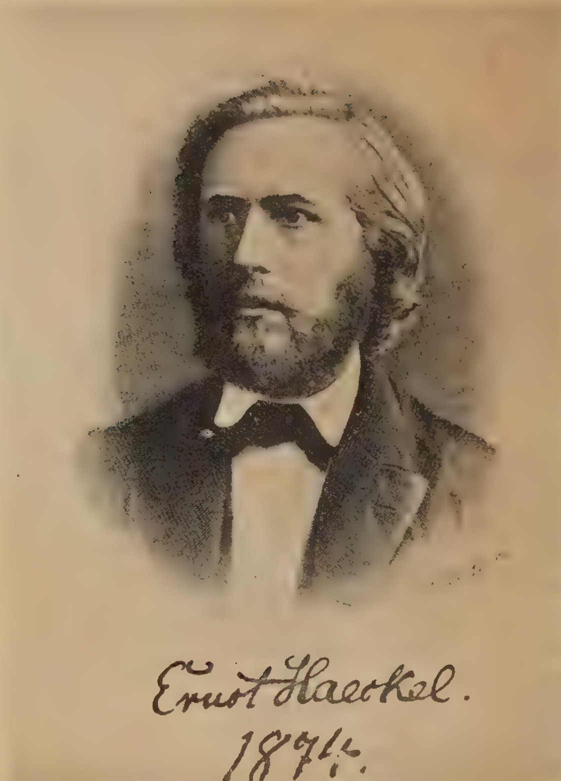


Fig. 198.

Ernst Haeckel (1834—1899) of Jena, introduced Darwinism into Germany. In his book *Generelle Morphologie*, 1866, he gave a classification of organisms formed on an evolutionary basis. His *Anthropologie* (1874) was a treatise on human embryology.

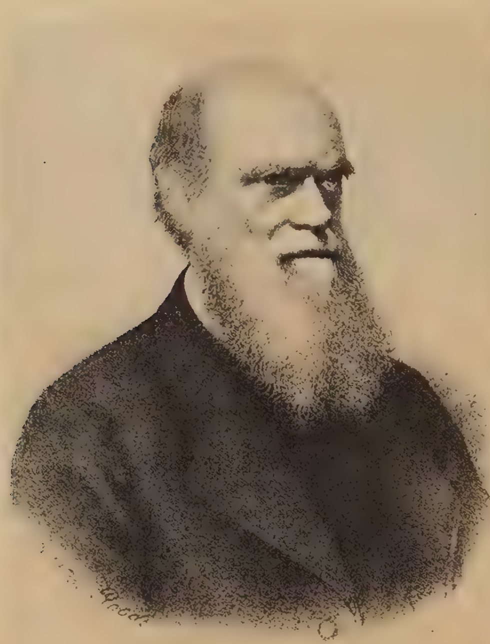


Fig. 197.

Charles Darwin (1809—1882) founder of the theory of evolution of which the first germ are to be discerned among the early Greek philosophers. In 1871 in *The Descent of Man* Darwin set forth views that have since profoundly influenced anatomical development.

Fig. 199.

Hugo de Vries, (1848—). who in conjunction with C. Correns and E. Tschermak, re-discovered in 1900 the important work of Gregor Johann Mendel (1822—1884) on genetics. His experiments on the plant *Oenotheria Lamarckiava* led him to advance his *mutation hypothesis*, which involved the idea of the abrupt or spontaneous origin of species in distinction to the more gradual action of the factors in the natural selection of Darwin. Darwin sought the origin of species in external events, Mendel and de Vries in internal factors. The two theories supplement each other.

(H)
37^{50}